JULY 29, 1948
American Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NEW HEALD BORE-MATICS BOOST PRODUCTION 167%

...and Manufacturer Gets Lower Costs—Higher Quality Product—Finer Finish

Here's another example of how manufacturers are reducing costs—improving quality with the new Heald Bore-Matics.

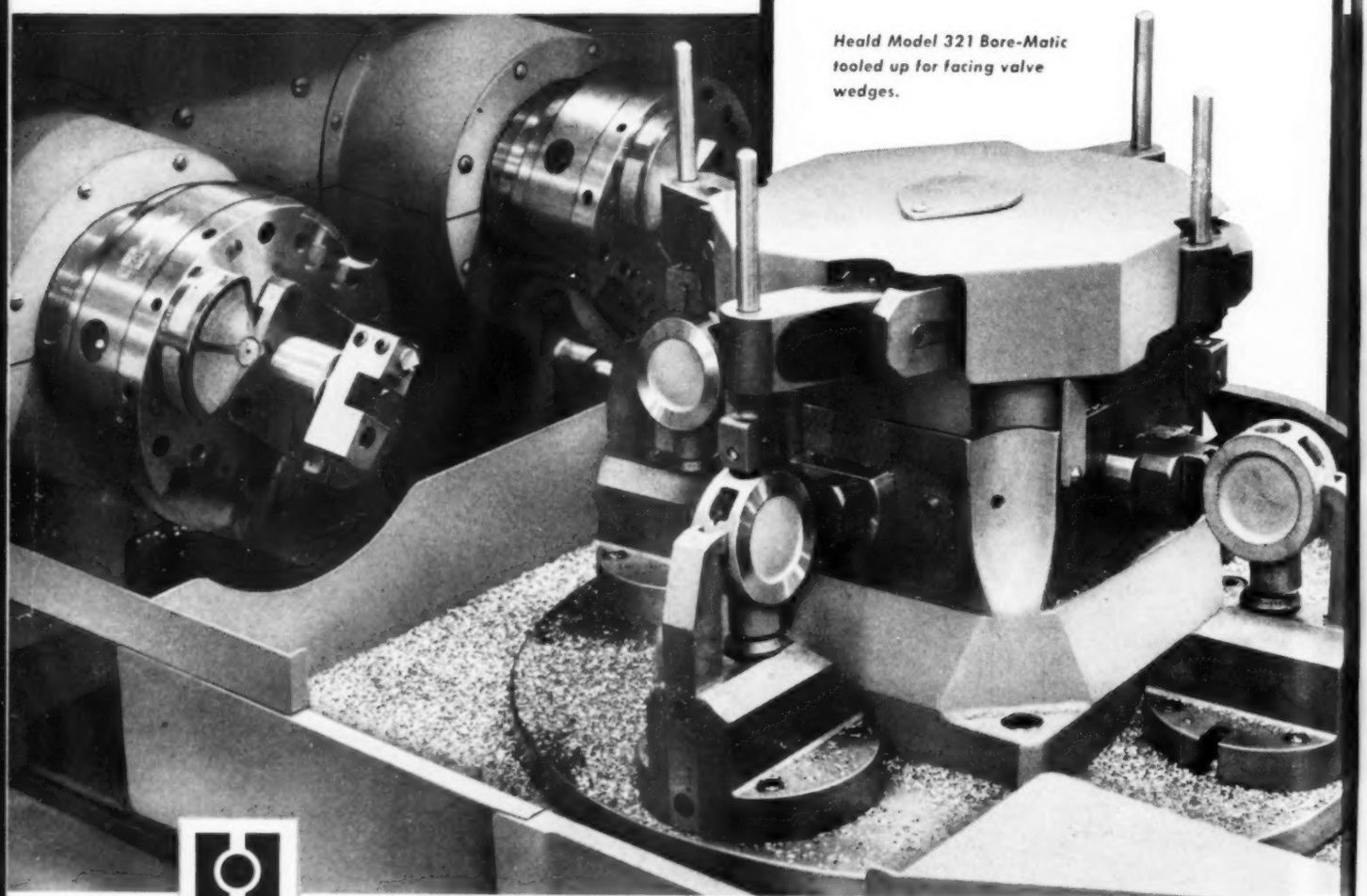
After replacing the slow, fatiguing equipment previously used by new, fast, easy-to-operate Bore-Matics, a valve manufacturer was able to increase production 167%! Besides this big saving in direct costs, finish was greatly improved, permitting the elimination of an inspection operation before assembly.

Both valve wedges and bodies are borized—the setup below illustrating the facing operation on wedges. Opposite faces are finished simultaneously by two boringheads with cross feed units. Fixture has four stations permitting loading during the facing operations.

These new Heald Bore-Matics offer the same opportunity for lowering *your costs*—whatever you manufacture. For complete information, contact your nearest Heald representative, or call on us here at Worcester.

IMPROVE YOUR PRODUCT— LOWER YOUR COSTS—
with these New Bore-Matic features

As in this installation, you too can improve product quality, increase production and cut costs by finishing parts on Heald Bore-Matics. Such features as—faster table traverse—higher speeds—quicker starting and stopping—constant feeds—low temperature hydraulic system—ventilated base and bridges—cool running heads—perfected way lubrication—universal valve manifold—leakproof piping, and many more—can save you time and money . . . they're worth investigating.



Heald Model 321 Bore-Matic tooled up for facing valve wedges.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Chips and QUIPS

Our Cover . . . At the end of each tractor assembly line in the Springfield Works of Allis-Chalmers Manufacturing Co. is a modern pit-type, downdraft paint spray booth where a finish coat of Persian orange enamel is applied with spray guns. The HD-5 crawler tractor shown is equipped with a "Tracto-Shovel" having a "struck" capacity of 1 cu. yd. This unit is hydraulically controlled by the tractor operator. Approximately 2 gal. of enamel are used to finish each tractor. Joseph E. Goulet, works photographer, took the Kodachrome.

For details on the conveyors in this plant, see Ben Brosheer's article in which he describes four systems of drag-chain conveyors which serve production, warehousing and shipping in this widely spaced unit. . . . The picture also typifies our special report on "How to Paint the Product"—although Part II, in this issue, deals with brush-painting techniques and equipment.

Production . . . Packard faced some unusual problems in forging critical automotive parts. George Daschke and Harold Lawson, forge-shop supt., tell herewith how some were solved . . . Then R. E. Whinrey, supt. of the Dodge plant of Link-Belt, describes how a small chip-handling department serves 22 automatics; there are some Shop Shots from International Harvester, a process sheet for chromising steel, a page of stamping data from General Motors, and some tricks with vises converted to jigs . . . And D. A. Johnson of Reliance Electric shows two types of jib cranes his plant uses. Some 69 jibs are among materials-handling devices that make it unnecessary for any man to lift over 10 lb.

Clear? . . . Our editors, art director and illustrators work out more than 2500 drawings and sketches a year, from originals supplied by representative metalworking plants. We are amazed at the quality of many of these drawings—not good, but unbelievably indistinct. All we need is proportions and outline, but what of the toolmakers and shop men who must work from similar ones? Unreadable dimensions and specs are common. Undoubtedly it saves time and money to make pencil tracings on poor stock, but what of the time wasted by production men as they try to read the unreadable copies?

Help Needed . . . Prof. L. Burnat of the Zaklad Obrobki I Politechnika, Lodz, Poland, asks for catalogs and instruction booklets on American machine and metal-cutting tools. He'd like large photos and operating schedules for common parts, too, so his students in this polytechnic university can get "the right idea of U.S.A. progress."

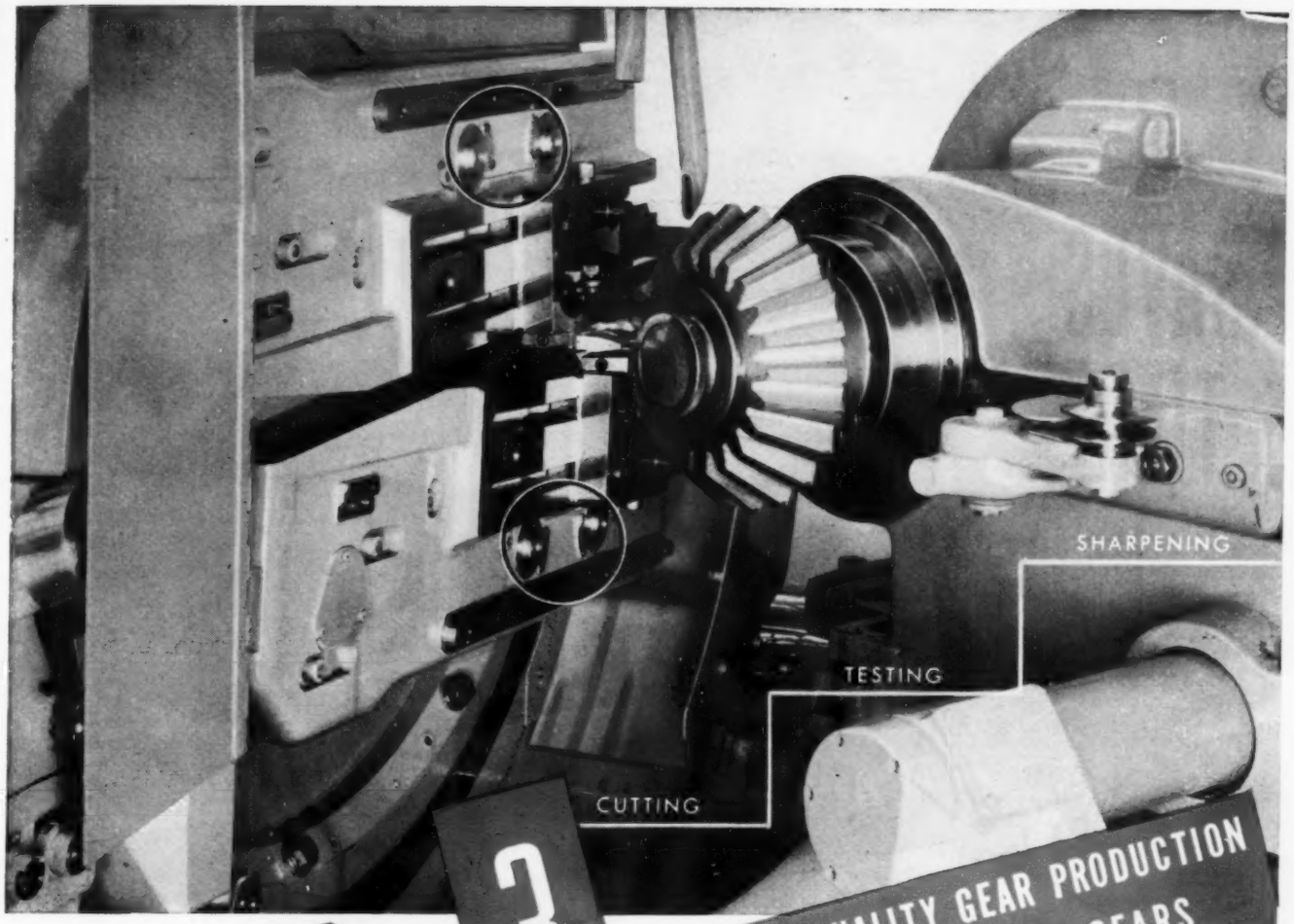
Fluorescent . . . If an incandescent bulb goes dark, the bulb is burned out . . . but if a fluorescent dies, it can be tube, starter, ballast or fixture. As so many metalworking plants now use these lights, we went to headquarters for details of how to test and service them without specialists. L. R. Keiffer and C. L. Amick of the Engrg. Div., Nela Park, have given us a step-by-step explanation which you can use.

These Covers . . . Readers continue to wonder where our 4-color covers come from. Some we take ourselves; others are taken by company or commercial photographers in the field. There's a trick to it, of course, because just a "pretty" picture isn't enough. We like to have it tell its own interesting story —or to tie in with a story in the issue.

Coming . . . Aug. 12 *A.M.* will include *two* special reports, one on designing work coils for induction heating, the other on migration of Metalworking plants south and west . . . There'll also be articles on hydraulic units, on metal polishing, boring tools for cast aluminum, maintenance oils for machine tools, how carbides are used in Finland, a new automotive special machine, some materials-handling and welding ideas, and several articles full of hot information but designed for cool reading.

Hubbing-Steel Man . . . **Anthony L. Pranses was born of American parents in France in 1920. His parents returned to Pittsburgh with him in 1924, but after graduation from high school he returned to Paris to enter the Sorbonne in architecture. World War II sent him back to the U. S., where he was graduated from Carnegie Tech in 1942 with a B.S. in metallurgical engineering.**

Upon graduation, Mr. Pranses became a U. S. Engineer officer in Alaska, for the Alcan Road, in the Attu Campaign and on the Alaskan general staff. In Nov., 1945, he was relieved of active duty as a captain. Early the next year, he became a metallurgical engineer in the Materials Engrg. Dept., Westinghouse Electric Corp., and has specialized in the metallurgy of plastics molds. In this issue, he describes air-hardening hubbing steels—less distortion and cracking, longer mold life.



3 STEPS TO QUALITY GEAR PRODUCTION OF LARGE CONIFLEX* GEARS

Essential for the efficient manufacture of large Coniflex gears are the three machines shown—the straight bevel generator, the gear tester and the cutter sharpener as a unit assure accurate consistent quality of straight bevel gears.

Gleason No. 12 Generator Tool Sharpener

Gleason No. 27 Hypoid Tester

1 **The new Gleason No. 24A Straight Bevel Generator . . .** simple dial adjustment to obtain the desired amount of localized tooth bearing . . . close and fast roughing of heavy pitch gears using Tanruf and Tan-Acruf tools . . . conveniently located, hydraulically operated controls for simple operation.

2 **The Gleason No. 27 Hypoid Tester . . .** a constant check on the gears during production and to establish the best operating position in final assembly.

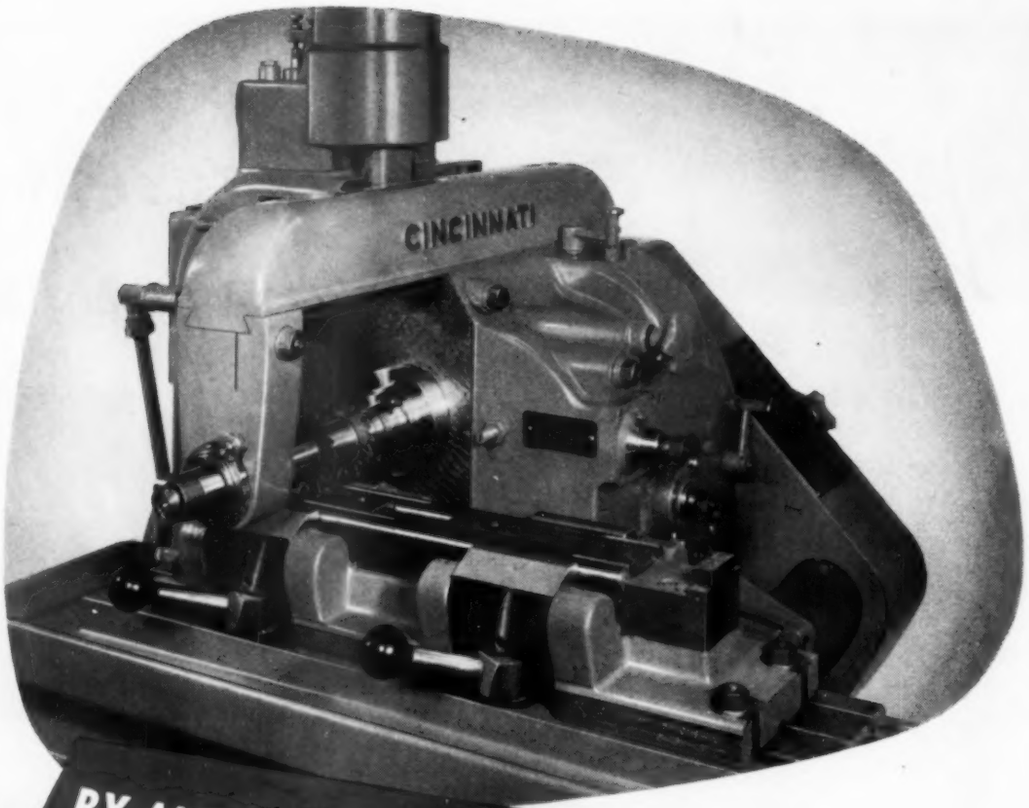
3 **The Gleason No. 12 Generator Tool Sharpener . . .** a wet-type grinder . . . providing smooth surface finish and assuring the greatest degree of life from cutting tools.

*Coniflex—Straight bevels with localized tooth bearing. Reg. U. S. Pat. Off.

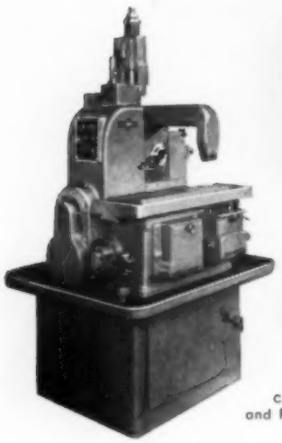
GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years

IT SAVES TIME



BY AUTOMATICALLY JUMPING OBSTRUCTIONS



CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine. Catalog M-1607.

Drawing of the part, and diagram of the automatic cycle employed in milling two short keyways in one setting.

CYCLE

Lower carrier	Lower carrier
Feed table right	Feed table right
Raise carrier	Raise carrier
Rapid advance table right	Rapid return table left
Feed table right to accurate location	Stop

PRODUCTION DATA

Part name	Shaft
Material	SAE 1112 steel
Operation	Mill two keyways
Spindle speed	117 rpm
Table feed	10 in./min.
Production	104 per hour
Equipment	CINCINNATI No. 0-8 Rise and Fall Milling Machine equipped by Cincinnati Application Engineers

● Grade school boys always take the shortest distance between two points . . . race over lawns, jump over hedges, climb over or under fences. For them it's so much easier. The same dexterity can be employed to advantage in many milling operations. CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machines supply the dexterity by jumping over obstructions in the way of milled surfaces; save time by combining operations. ¶ The illustration above shows how this timesaving automatic feature—mill, jump over space, mill—is employed in milling two short keyways in a shaft. To reduce the cost still further, Cincinnati Application Engineers designed the fixture to hold two parts. Inexpensive "cycle selectors" (they can be interchanged in less than a minute) coordinate the longitudinal and vertical traverse movements. ¶ CINCINNATI No. 0-8 Rise and Falls can be employed in other ways, too: for conventional straightaway milling cuts, *to retract the cutter on the return stroke and save the finish.* Catalog M-1607 gives additional data. Brief specifications in Sweet's Catalog File for Mechanical Industries.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

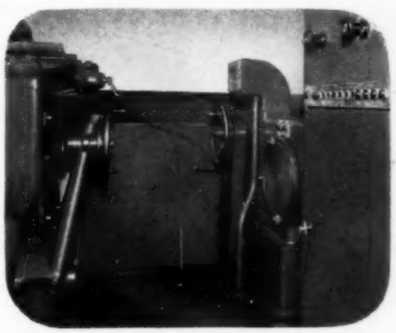
CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CINCINNATI FILMATIC

Traveling Wheelhead Roll Grinders

Grinding a paper mill roll on a CINCINNATI FILMATIC 36" x 288" Traveling Wheelhead Roll Grinder. Other standard sizes: 44", 50" and 60".



Operator's platform on carriage of CINCINNATI FILMATIC Traveling Wheelhead Roll Grinder.

Most important grinding development in a decade, automatic wheel balancing is explained in pamphlet G-538. Write for copy.

Ace High in Dependability

● In steel and paper mills, production leans heavily on dependability of the roll grinding machines. And the most dependable, timesaving roll grinders for any shop are CINCINNATI FILMATICS. That's because of their sturdy, rugged design and many features for efficient, rapid grinding. Consider only two of them:

FILMATIC grinding wheel spindle bearings . . . withstand heavy and continuous grinding operations; require no adjustment for high quality finish grind; run for years without attention other than routine lubrication.

Automatic wheel balancing . . . without removing the wheel mount from the machine, this unit *automatically balances itself within a few seconds*. Hard to believe? Write for the pamphlet illustrated at left, G-538, and see how it works.

Ask for a visit from our roll grinder specialist. He will be glad to tell you more about CINCINNATI FILMATIC 36", 44", 50" and 60" Traveling Wheelhead Roll Grinders.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

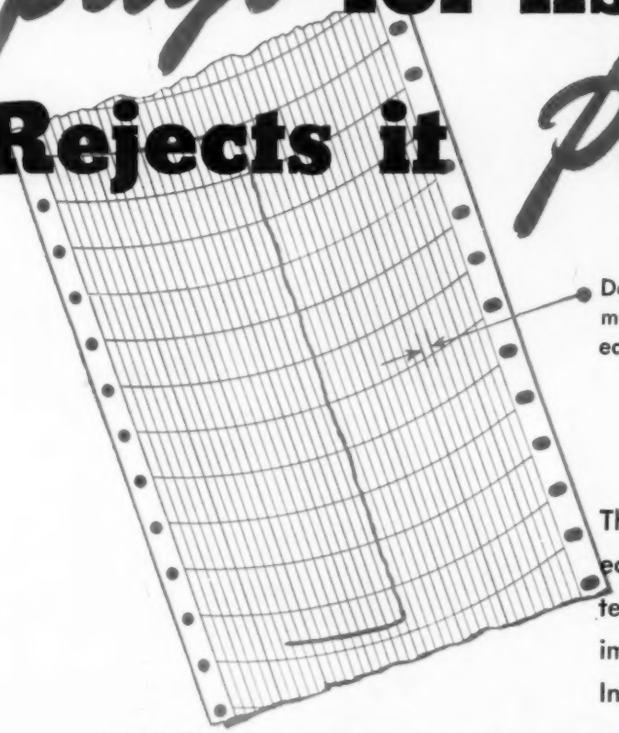
CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

Involute Inspection in the

GEAR SHAPERS • THREAD GENERATORS • CUTTERS • SHAVING AND BURNISHING MACHINES

Pays for itself

Rejects it *prevents*



Departures from true involute magnified 500 times... each space on chart = 0.0002"

The production of accurate gears on an economical basis... by the most advanced techniques of cutting and shaving... is one important phase of The Fellows Method. Inspection is another.

The Fellows Involute Measuring Instrument, for example, is an important part of production control. This sensitive instrument "feels"—through a carbide-tipped pointer—the slightest perceptible variance from profile perfection. The response is amplified electronically with great precision.

The inspector can observe minute errors to one ten-thousandth of an inch on a dial indicator. Readings can also be permanently recorded on a ruled paper chart, by an electrically-operated pen, which locates and measures errors in involute profile. All complicated calculations are eliminated.

A complete line of Inspection Instruments is available at Fellows. You are invited to contact our nearest office for complete information.

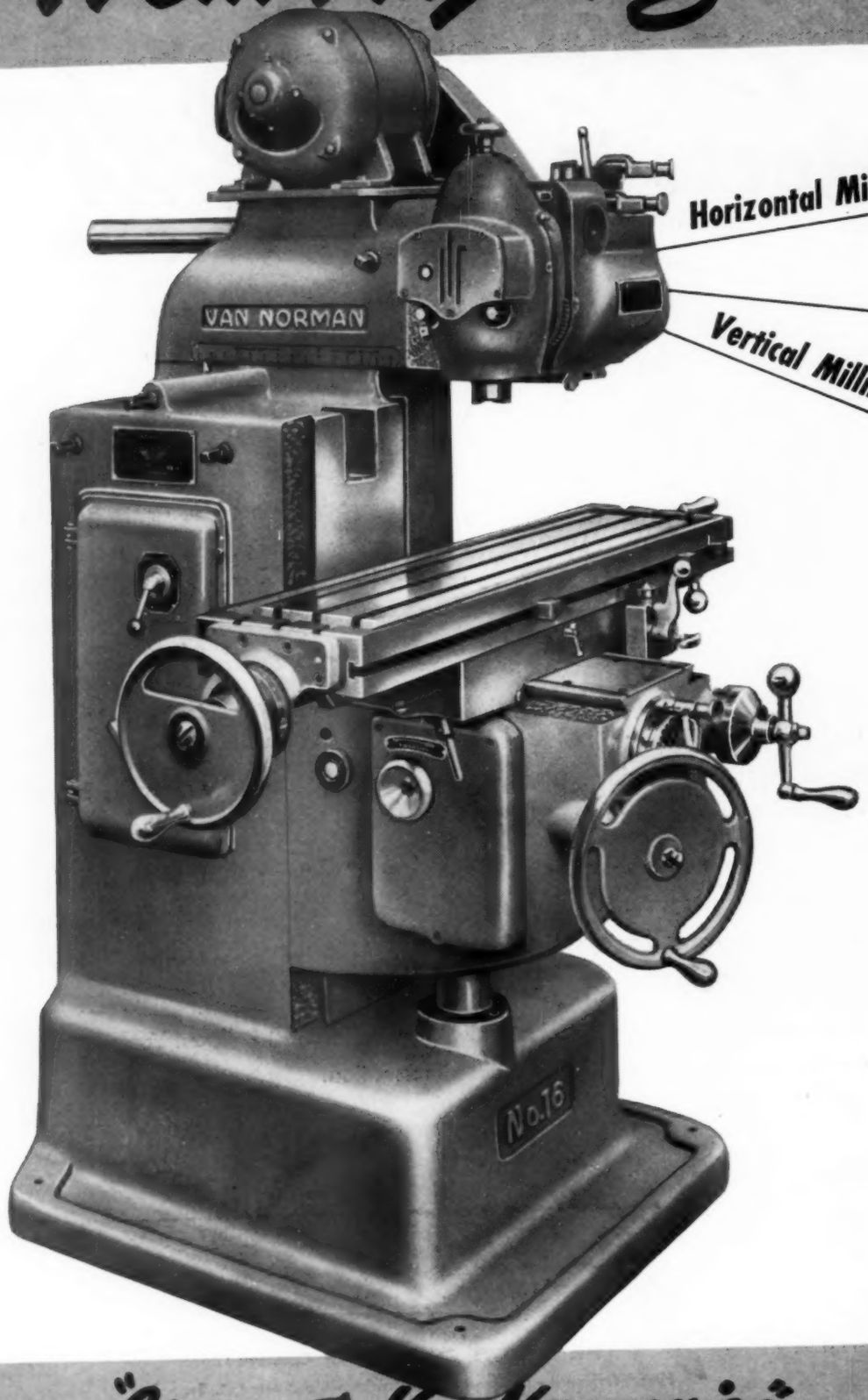
Fellows

THE FELLOWS GEAR SHAPER COMPANY

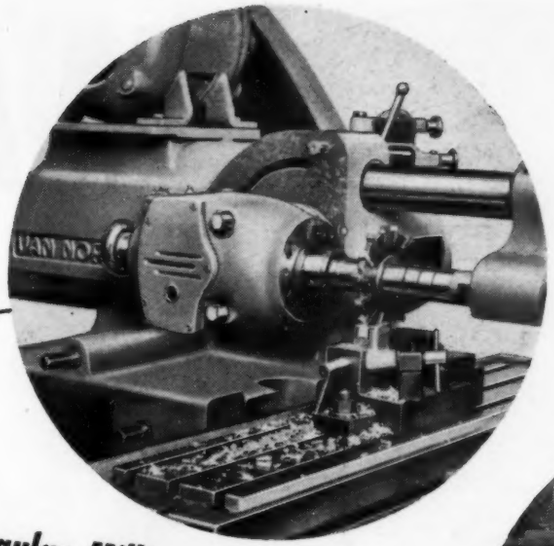
Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; 640 West Town Office Bldg., Chicago 12; 7706 Empire State Bldg., New York 1.

GEAR MEASURING AND INSPECTION INSTRUMENTS • PLASTICS MOLDING MACHINES

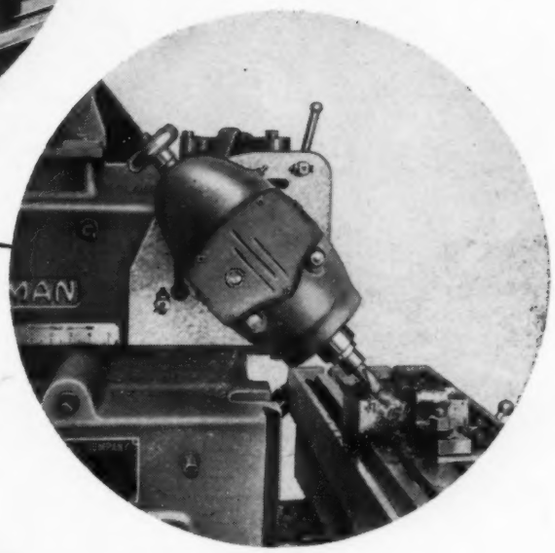
From Any Angle . . .

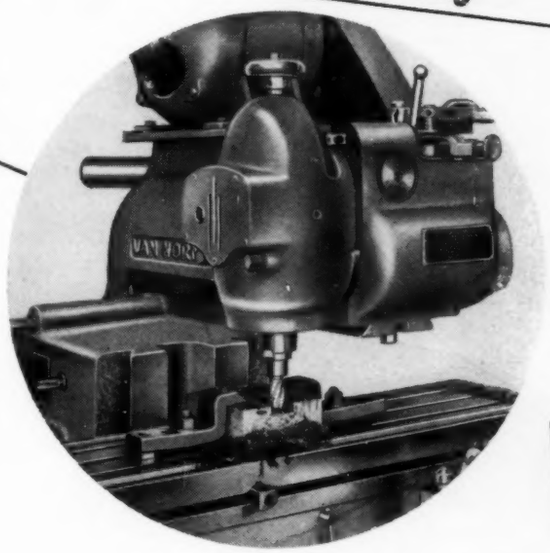


"It pays to Van Normanize"



Angular Milling





VAN NORMAN

NO. 16 RAM TYPE MILLING MACHINES INCREASE PRODUCTIVITY

This Van Norman No. 16 Miller gives you many outstanding and exclusive advantages that assure more workability for your plant.

The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The moveable ram plus the saddle cross feed increases the work range and capacity of the miller . . . enables you to handle larger work pieces with ease. Single lever built-in electrical control simplifies operation. Spindle speeds from 95 to 2,000 rpm give you the right speed for every type of cut. Add such construction features as hardened alloy steel gears, large hardened alloy steel multi-splined shafts, precision-ground feed screws, one-shot metered lubrication and you have a milling machine that provides greatest productivity, lowest cost milling and long operating life.

Write for bulletin, today

VAN NORMAN COMPANY

Springfield 7, Massachusetts

MASS of 5,700 BY

WORLD'S LARGEST EXCLUSIVE

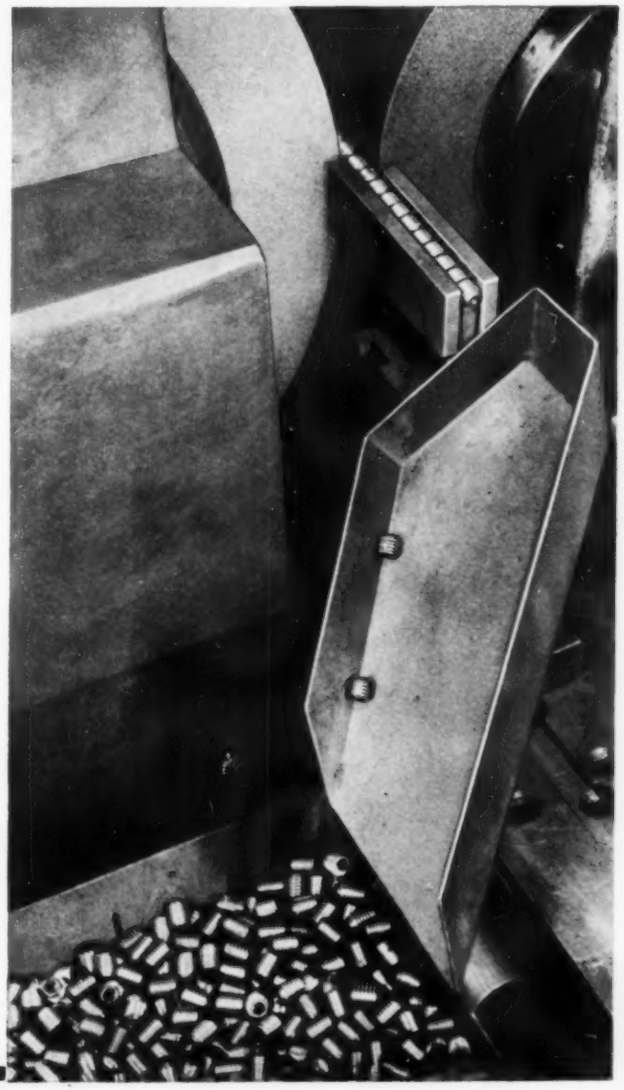
PRODUCTION Threaded Parts

SET SCREWS THREADED EVERY HOUR THRUFEED CENTERLESS GRINDING

• Completely automatic—the #1 Centerless Thread Grinder threads 1/4" by 5/16" 20 pitch hollow head set screws to standard tolerances at 5,700 pieces per hour. Blanks are fed continuously into the machine by a simple hopper—finished parts are ejected into trays ready for removal. Only partial supervisory attention is needed. Grinding wheel crushings are infrequent —the machine operates on an average of 40 continuous production hours—200,000 pieces—between wheel crushings.

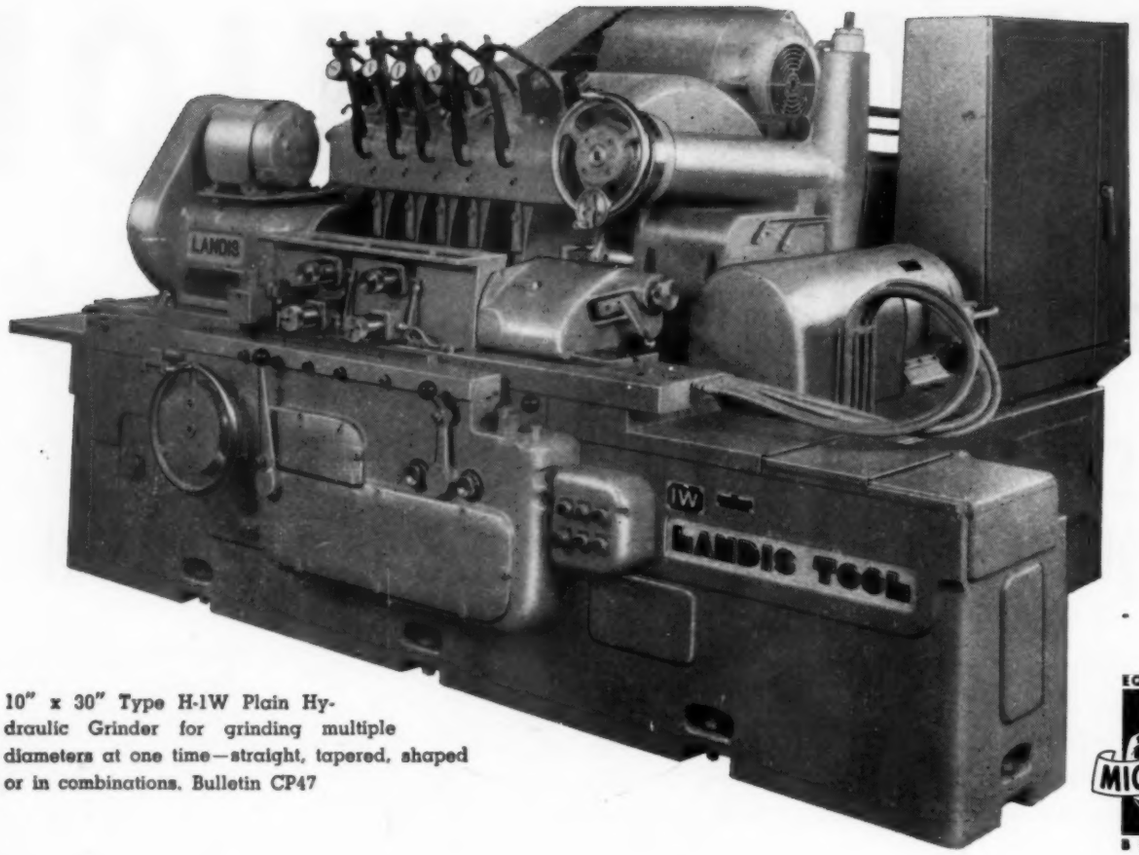
Any workpiece requiring threads on the maximum diameter only and without interfering shoulders which would prevent passage through the grinding throat can be centerless ground by the thrufeed method. Headed or shouldered pieces must be ground by the infeed process. Diametrical capacity is 1/16" to 4-3/4", thrufeed or plunge cut.

Write for Bulletin E-97



LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

MANUFACTURER OF THREADING EQUIPMENT

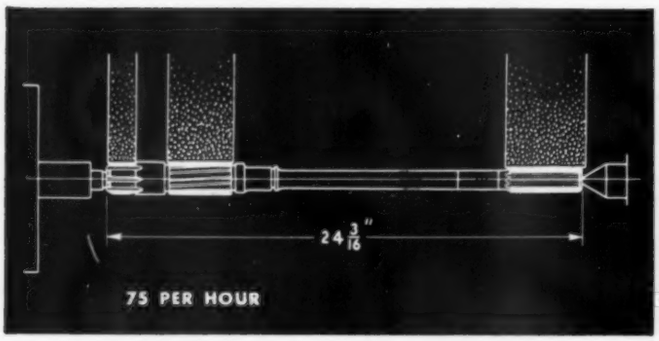


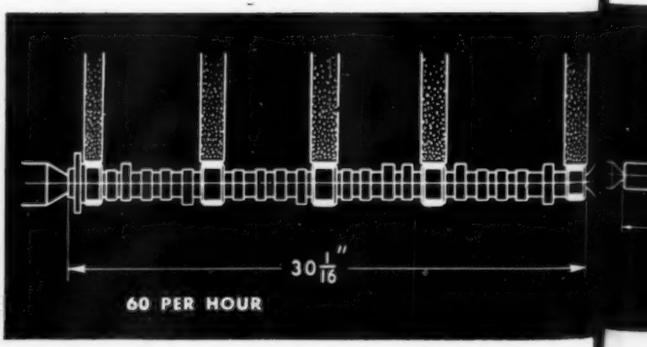
10" x 30" Type H-1W Plain Hydraulic Grinder for grinding multiple diameters at one time—straight, tapered, shaped or in combinations. Bulletin CP47

EQUIPPED WITH MICROSPHERE BEARINGS

New Multiple Wheel Grinder Gives Big Reduction in

- Cuts unit costs
- Increases production





LANDIS TOOL
Precision Grinders

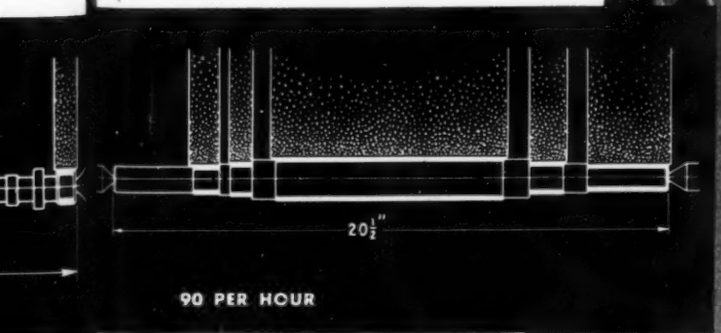
Our engineers will be glad to make production estimates and tooling suggestions on the basis of your blue prints.

high production features

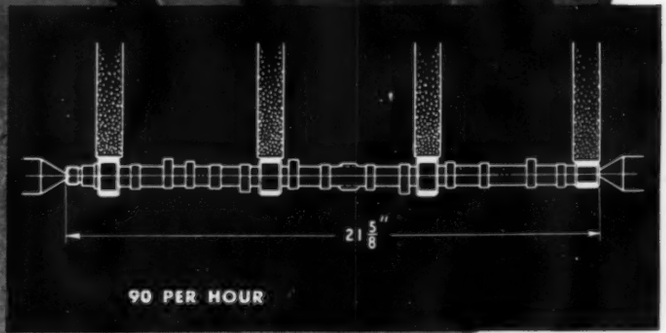
PRESSURE LUBRICATED MICROSPHERE
WHEEL SPINDLE BEARINGS
TAMPER-PROOF FEED and TRAVERSE
ADJUSTMENTS
HYDRAULIC GRINDING WHEEL FEED
Hydraulic rapid infeed
Hydraulic slow grinding feed
AUTOMATIC HYDRAULIC BACKRESTS
TWO-SPEED HYDRAULIC WHEEL DRESSING
Automatic Rapid traverse
between wheels
PROFILE BARS FOR WHEEL DRESSING

in Grinding Costs

5 different diameters and flange face — ground at the same time by infeed grinding with 5 different wheels on the same spindle.



90 PER HOUR

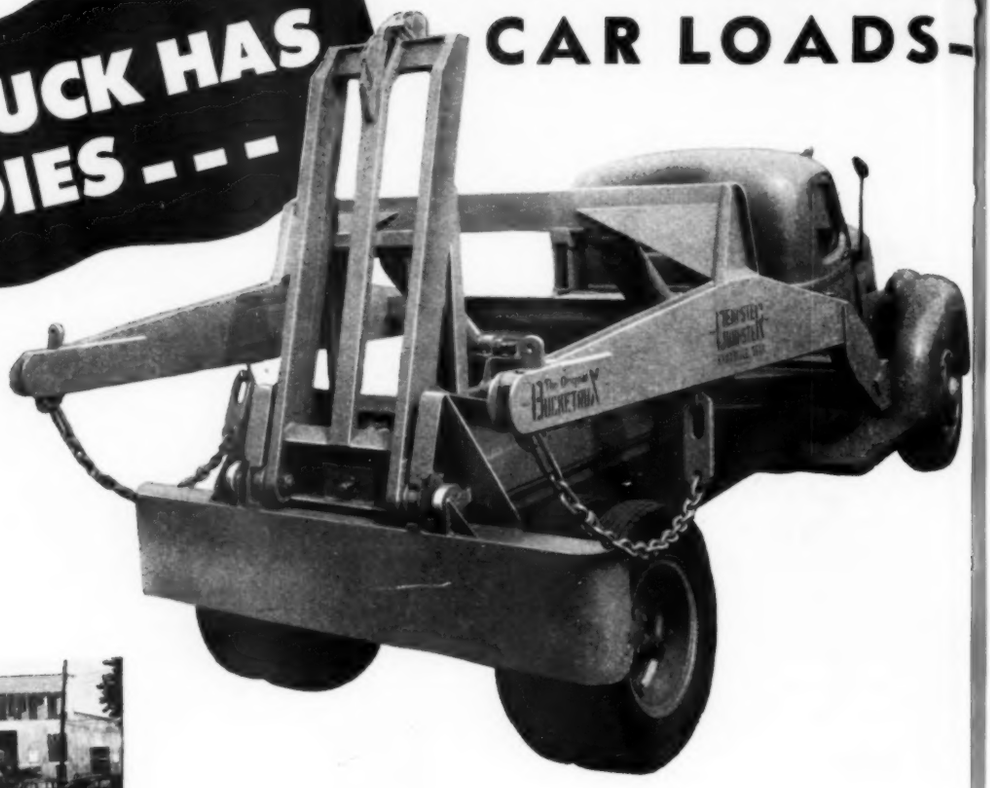


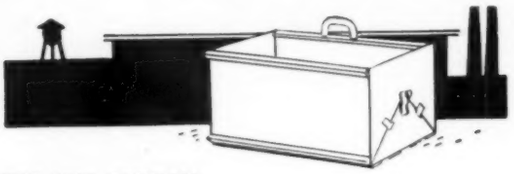
90 PER HOUR

LANDIS TOOL COMPANY / 18 E. SIXTH STREET / WAYNESBORO, PA.

THIS TRUCK HAS 37 BODIES - - -

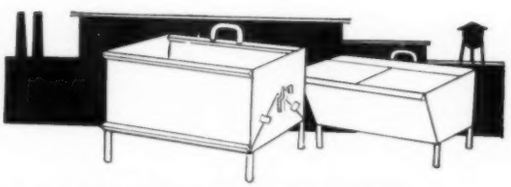
. . . HANDLES 2 CAR LOADS - O





FELT MILL DIVISION

Produces 30 cu. yds. of scrap and clean-up per day. Two, 6 cu. yds. Heavy Duty Drop Bottom Bodies are used.



ROOFING MILL AND MACHINE DIVISION

Produces 104-1/2 cu. yds. of tabs, shingle scrap, slate scrap and roofing scrap per day. Seventeen, 5 cu. yds. Drop Bottom Bodies on legs and two, 2 cu. yds. Water-Tight Tilt Type Bodies on legs are used.

Shown at right are 4 standard types of Dempster-Dumpster bodies. Many variations are available to make these bodies meet every materials handling requirement. Sizes range from 1-1/2 to 20 cu. yds. capacities. A Dempster-Dumpster engineering survey, without obligation to you, will doubtless show tremendous savings for your plant. Write or wire us now.

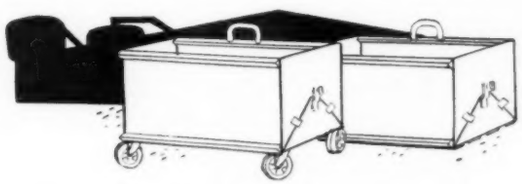
220 CUBIC YARDS—4 RAILROAD CARS—OF WASTE AND SCRAP DAILY—

HERE IS A TYPICAL EXAMPLE OF LOW COST DEMPSTER-DUMPSTER MATERIALS HANDLING IN INDUSTRIAL PLANTS. IN THIS CASE, IN A LARGE ROOFING PLANT.

In one of the nation's largest roofing plants, collection and removal of waste and scrap had developed into an expensive problem. Approximately 220 cu. yds. —about 4 railroad car loads—of every type of waste . . . heavy, light, bulky, moist and dry, had to be collected daily from many points in this widespread plant . . . some in driblets, some in large volume. A more flexible, less expensive system of collection was vital.

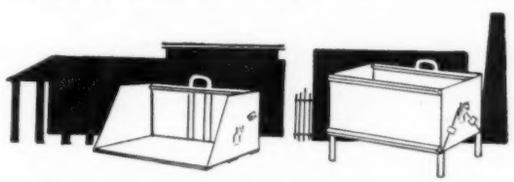
A Dempster Engineering Survey showed how one Dempster-Dumpster Hoisting Unit on truck, serving 37 detachable bodies of various types could collect and dump the plant's entire daily scrap output in only eight hours. As a result of this comprehensive survey, Dempster-Dumpster system was put to work. Spotting the bodies at predetermined accumulation points throughout the plant, the truck hoisting unit and one man, the driver, hydraulically pick up each body as it is filled . . . haul it . . . dump it and return it for reloading (as illustrated at extreme left). The different types of bodies were ordered for most effective materials handled . . . heavy duty bodies for heavy slate scrap . . . light bodies for light bulky felt scrap. Bodies on casters, pushed right up to the machine to receive scrap, eliminated wheelbarrow and hand carrying. At another point bodies are carried in and out of the building by the plant's power driven platform-lift trucks. Scrap collection in this plant is now made on an efficient time-table basis. Savings, over the original cost of handling waste and scrap, have paid for the entire installation in almost 12 months. In many other installations in less time.

Here is how the Dempster-Dumpster System serves all plant sections simultaneously. Replacing an obsolete system of truck-drawn hard wheel trailers, clumsy bins, wheelbarrow handling and hours of useless clean-up time, this installation comprises one truck hoisting unit and 37 bodies in 7 different types. Bodies receive the scrap as it accumulates. When a body is filled, it is picked up by the truck hoisting unit, carried to the disposal area, dumped and returned for refilling. Seven main plant sections are served by the truck hoisting unit, as shown below. Amount of scrap produced and body used is also shown.



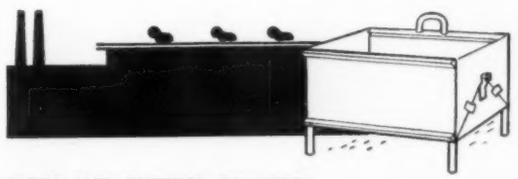
HYDRO-PULPER DIVISION

Produces 28 cu. yds. of scrap per day. One, 6 cu. yds. Heavy Duty Drop Bottom Body and four, 6 cu. yds. Drop Bottom Bodies on casters are used.



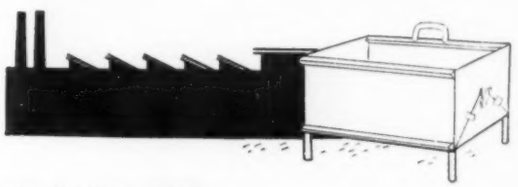
LOADING DOCK AND POWER HOUSE

Produce varying amounts of waste, debris and waste coating in drums. For loading Dock, one 2-1/2 cu. yds. Skip Type Body. For Power House, one, 2-1/2 cu. yds. Drop Bottom Body on legs are used.



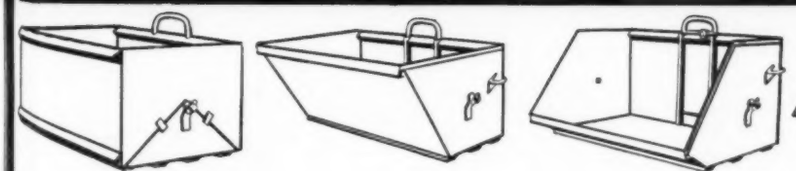
PRESS AND CUTTING DIVISION

Produces 24-1/2 cu. yds. of roofing scrap and cuttings per day. Five, 5 cu. yds. Drop Bottom Bodies on legs are used.



DIE CUTTING PLANT

Produces 30 cu. yds. of scrap per day. Four, 4 cu. yds. special duty Drop Bottom Bodies on legs are used.



DEMPSTER DUMPSTER TRADE MARK REG. SYSTEM

DEMPSTER BROTHERS, Inc., 478 DEMPSTER BLDG., KNOXVILLE 17, TENNESSEE

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You will find a ball or roller bearing (mounted or unmounted) for almost any general industrial use in the *complete* Link-Belt line.

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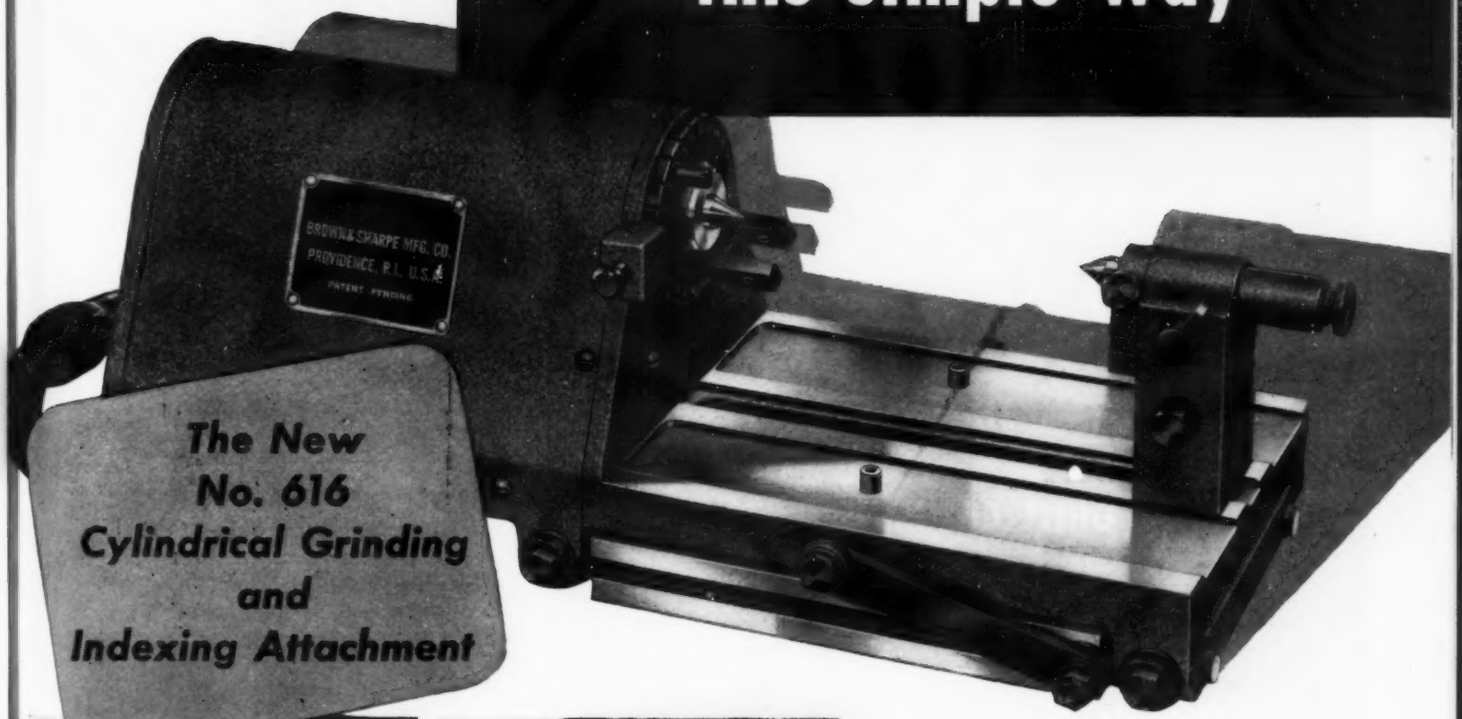
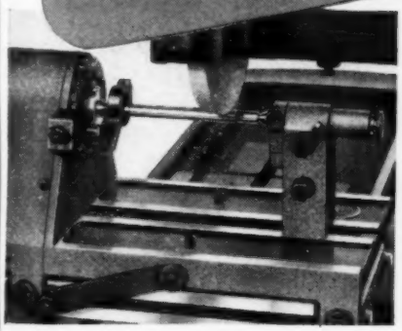
LINK-BELT BALL AND ROLLER BEARINGS

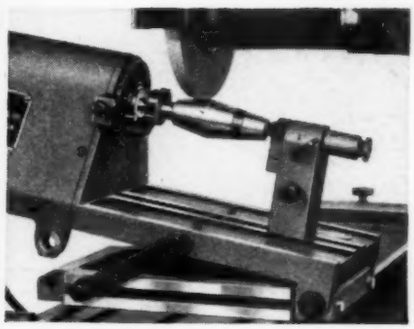
ENLARGE Your Grinding Facilities this simple way



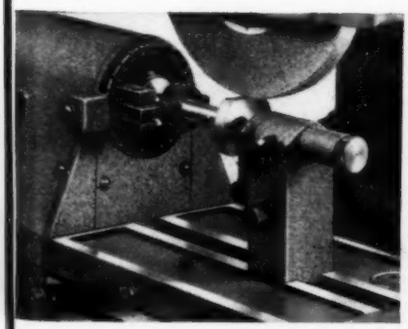
The New No. 616 Cylindrical Grinding and Indexing Attachment



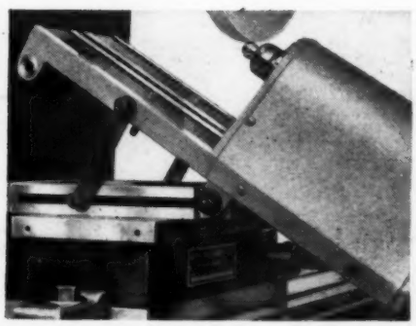
● Grinding work held between centers. Tailstock center is withdrawn for work change by simple swing of lever.



● Grinding taper shank. Attachment is readily adjustable to the desired taper.



● Grinding parallel flats using index plate. Index plate has 24 slots — is locked or released by plunger.



● Angular grinding of work held in spring collet. Attachment is held on permanent magnet chuck.

. . . for Surface Grinders

This new Brown & Sharpe Cylindrical Grinding and Indexing Attachment is designed to be used on surface grinders for dry grinding small cylindrical work, tapers and work requiring indexing. It is a simple way to enlarge your grinding facilities and may make unnecessary an investment in extra equipment.

Straight cylindrical or tapered work is ground between centers or, if ½" diameter or less, can be held in indexing spring chuck. Indexing is performed with headstock index plate or with interchangeable indexing spring chuck.

Centers swing 6" diameter; take work 5¼" in length. Maximum grinding angle, 45°. 1/60 H.P., 115V., A.C. motor is completely enclosed. Write for illustrated folder. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

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AN *Economical* GRINDER FOR LARGE WORK . . .

- JET PROPULSION PARTS
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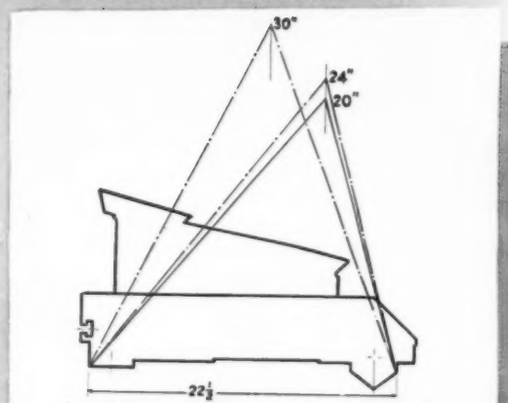
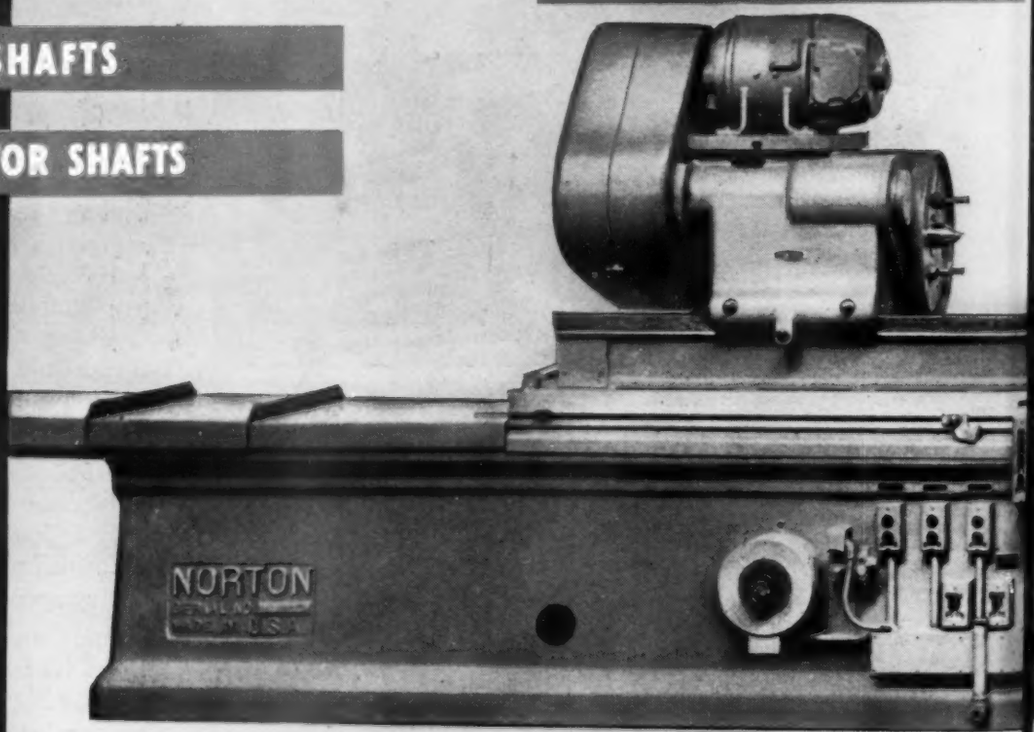
- HEAVY CRANKSHAFT BEARINGS
- RADIAL DRILL COLUMNS
- LONG BORING BARS
- TURBINE SHAFTS
- HEAVY MOTOR SHAFTS



Stability Triangle 20"-24"-30"
Type RW Machines



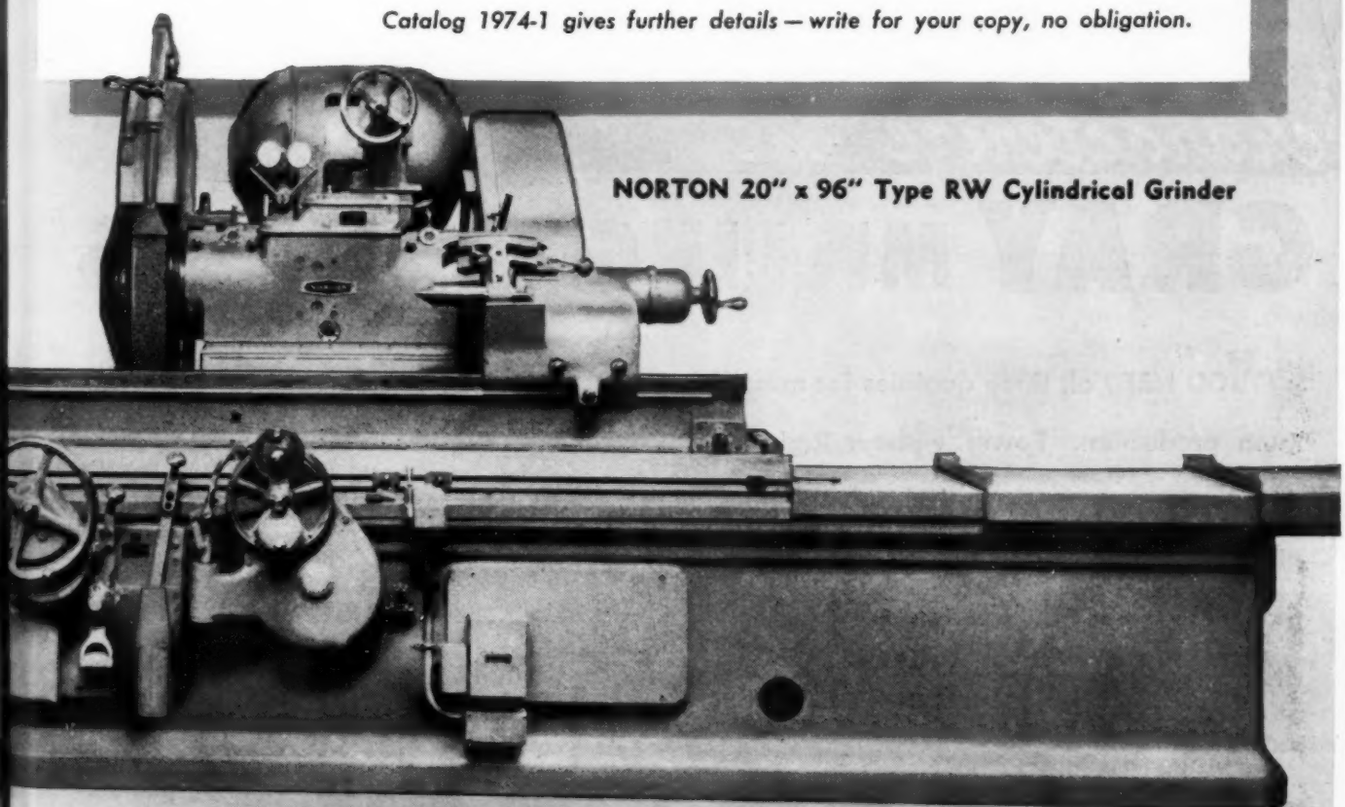
Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

The NORTON Type RW Cylindrical
Three Swings - 20″ - 24″ - 30″

Yes, you really can grind large work on a profit-producing basis with the Norton Type RW Grinder. You'll find each one of its three swings (20″, 24″, 30″) and seven lengths (36″, 48″, 72″, 96″, 120″, 144″, 168″) designed especially for heavy jobs — up to a maximum of 10,000 pounds. Its ultra-generous proportions and rigidity assure top performance month-upon-month with a very minimum of maintenance. Some Type RW features are:

- **Heavy wheel unit performs heavy roughing cuts – or the finest precision finishing**
- **Rugged headstock and footstock – 2½″ diameter centers – for strong work support**
- **Wide table ways for extra-sure support and accuracy**
- **Heavy base casting for rigidity to prevent vibration and to insure fine finish**

Catalog 1974-1 gives further details – write for your copy, no obligation.



NORTON 20″ x 96″ Type RW Cylindrical Grinder

M-566

NORTON GRINDERS
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POWER RIGIDITY CONVENIENCE

characterize the

GRAY MILLING MACHINES

YOU NEED all three qualities for maximum production. Power without Rigidity will cause poor work and short tool life. Rigidity without adequate Power means that you cannot drive modern cutting tools at maximum speeds, feeds, and depth of cut, but Power and Rigidity without Convenience will result in waste man hours and consequent inefficient operation. Therefore, we say you must have Power, Rigidity and Convenience for Maximum Production, and the Gray Milling Machine has all three.

The G.A. **GRAY** *Company*

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planer type milling machines
horizontal boring machines

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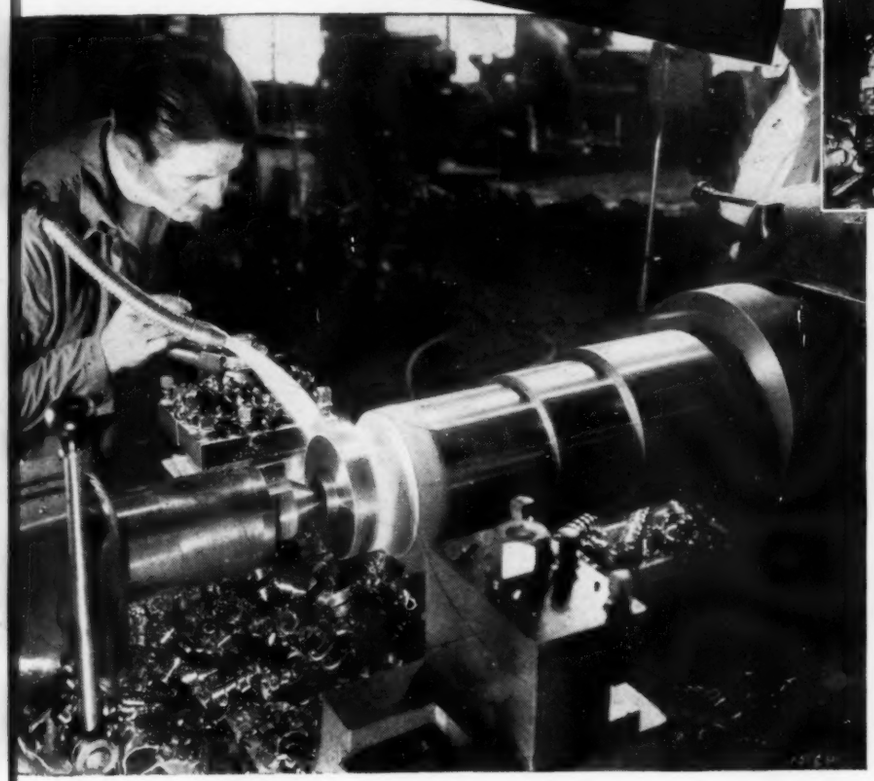
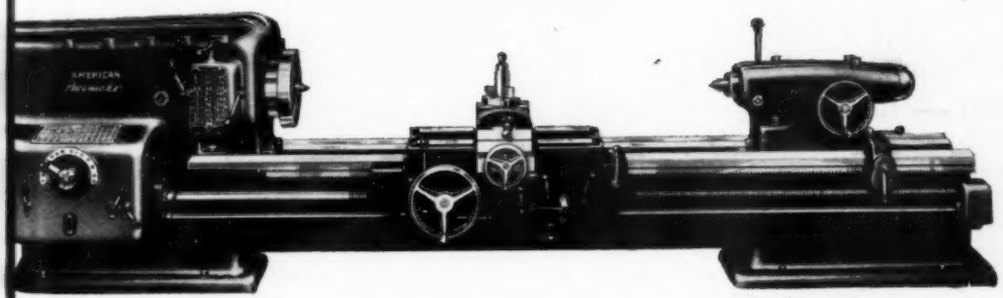
40 H.P. CUT





The new 25-inch "AMERICAN" Pacemaker Lathe powered with a 40 horse power driving motor is here shown machining Locomotive Main Pins from rough forgings. The cut being taken consumes 40 horse power and the time for the job is 30 minutes, floor to floor.

This is just a sample of what this new lathe will do. It is tremendously powerful and rugged and yet its ease of operation is amazing—finger tip control best describes it. It has speeds for both high speed steel and cemented carbide tools, a wide range of threads and feeds and a massive bed designed for chip disposal at the rear.

For machining axles this new lathe equipped with "AMERICAN" Hydraulic Duplicator is the latest contribution to lower axle costs.

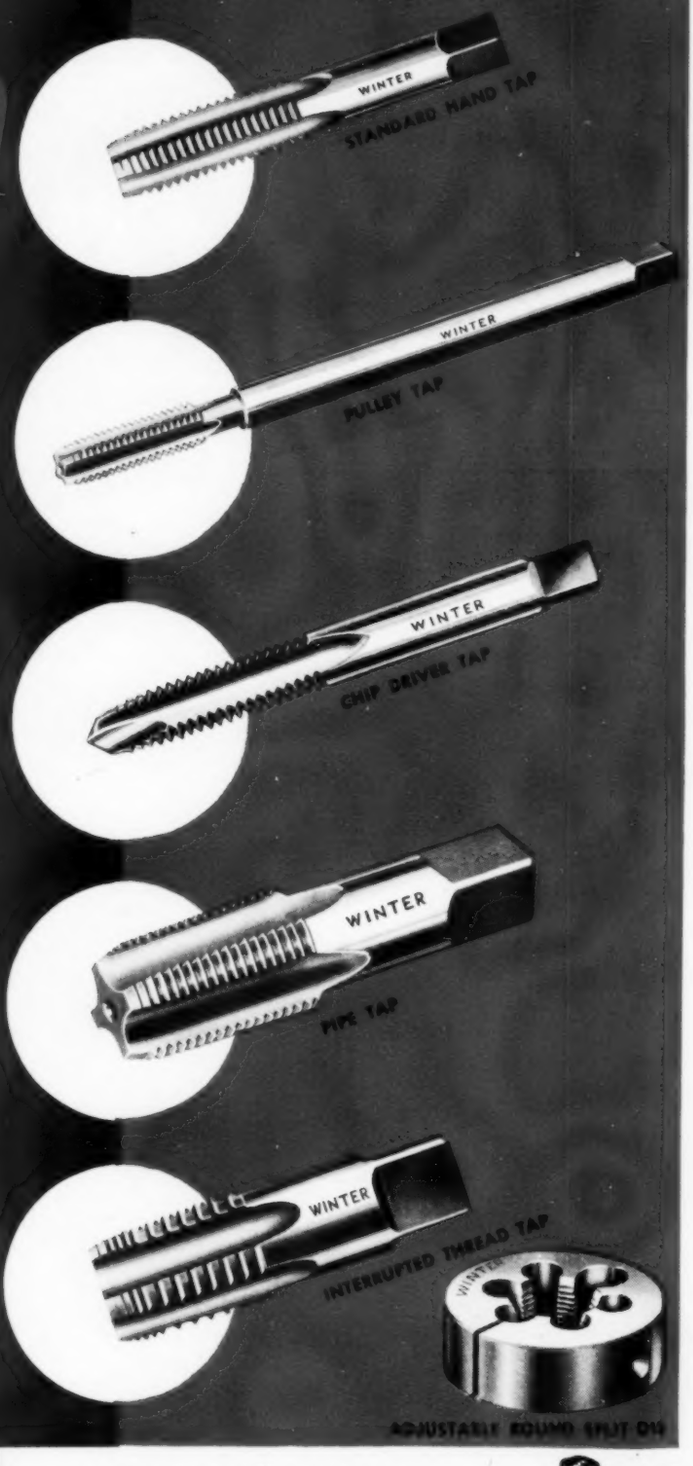
Send for descriptive Bulletin No. 23-A.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

WINTER SERVICE GIVES YOU BETTER TAP PERFORMANCE



No matter where your plant may be, there is a Winter Field Engineer ready to help you by recommending the right tap or die for your particular job. And the right tap or die is quickly available from your local Winter distributor. This combination of sound engineering advice and prompt delivery is what we mean by Winter Service.

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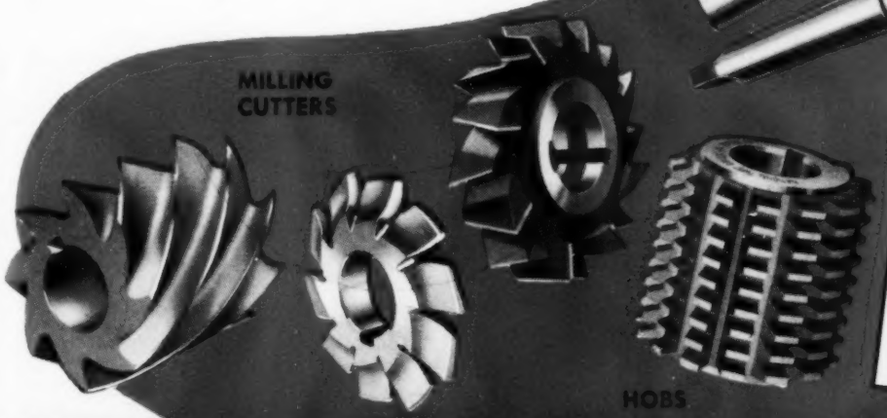
WINTER

THE RIGHT TOOL FOR YOUR NEEDS . . . *Always*

The cutting tool you want when you want it is sure to be found at your National distributors, for National manufactures a complete line of rotary metal cutting tools. Your quantity needs are met promptly too, because National factory stocks of tools are located conveniently near you—at New York, Chicago, Cleveland, San Francisco, and Detroit, and at the factory in Rochester, Michigan. Call on your National distributor for dependable cutting tools, promptly delivered.



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NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division—Winter Bros. Co.

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BULLARD MAN-AU-TROL V. T. L. AUTOMATICALLY MACHINES DIESEL WHEELS 3 TIMES FASTER

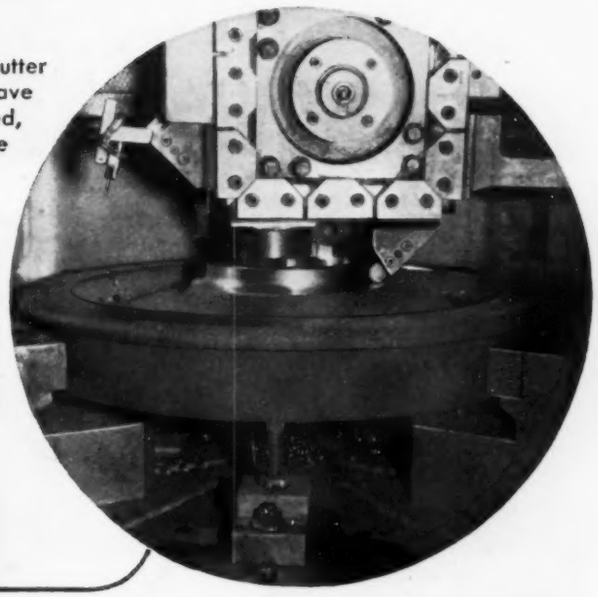
This BULLARD 54" Man-Au-Trol V. T. L. in the B. and M. R. R. shops at North Billerica, Mass., machines a wrought steel Diesel locomotive wheel in less than an hour, three times faster than the previous method. Man-Au-Trol Cuts Time between Cuts and Time on Cuts.

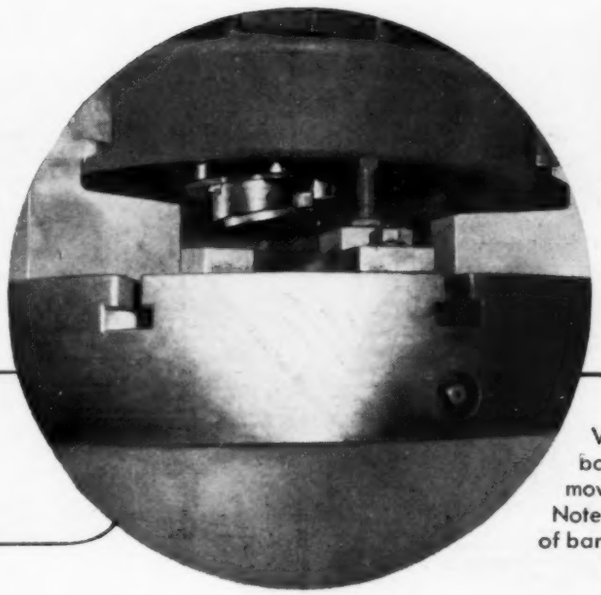
Your investigation of BULLARD Man-Au-Trol for your work will convince you that its combination of versatility, accuracy, productivity and cost-cutting ability is hard to beat. Write for Bulletin MAV-G-1 today. The BULLARD COMPANY, Bridgeport 2, Conn.

BULLARD MAN-AU-TROL MASTER OF THE MACHINE

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

Here the boring tool and turning cutter on B. and M.'s Man-Au-Trol V. T. L. have nearly finished their cuts. When finished, the head moves to the right to straddle face the hub.

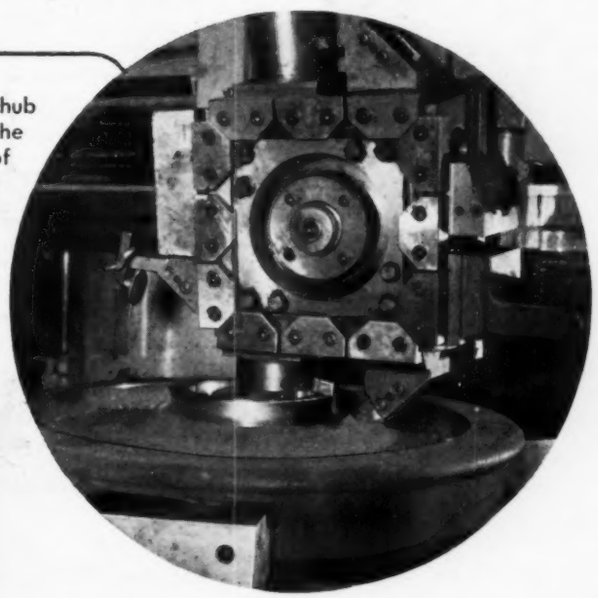


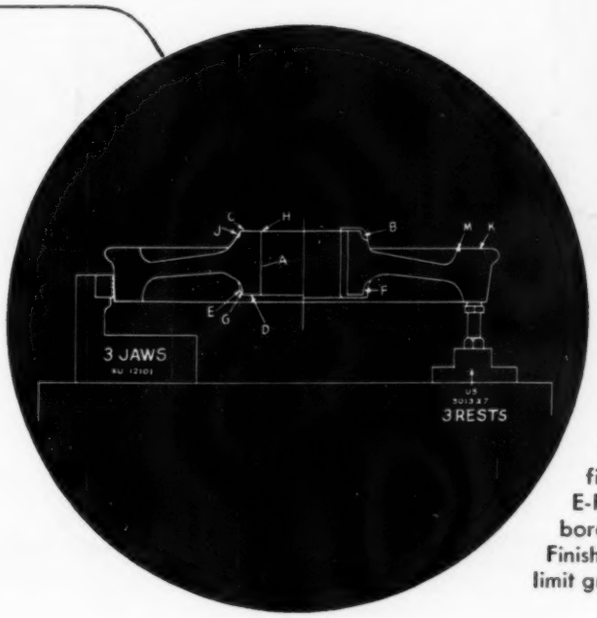


View from underside of wheel showing boring tool at end of cut, ready to move to the right to take straddle cut. Note lower straddle cutter on right side of bar.

How Diesel Locomotive Wheels Are Machined On 54" BULLARD MAN-AU-TROL V. T. L.

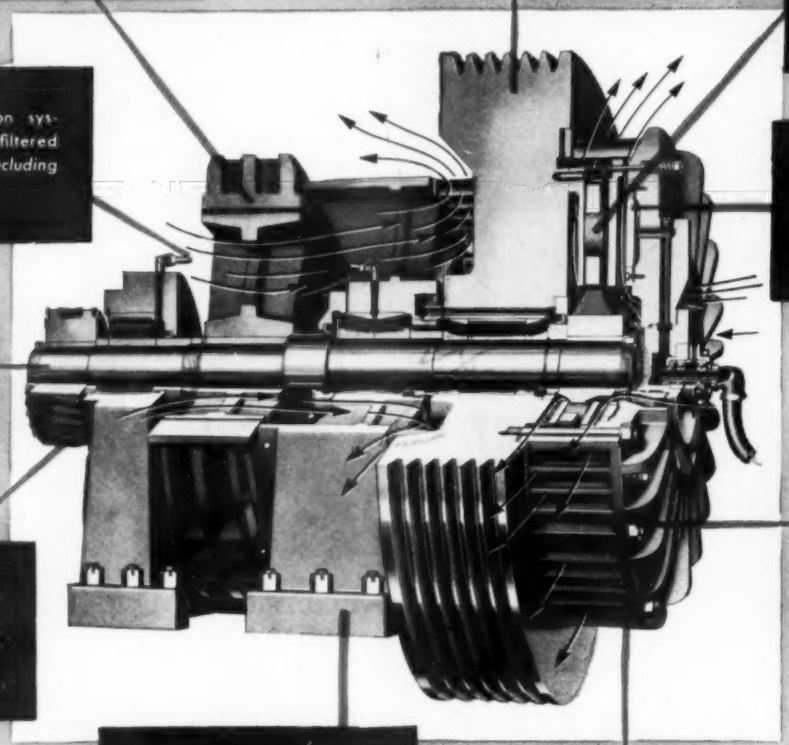
Here you see the finish of the hub straddle facing operation. Now the head and bar move left to center of bore and rise to index position for next operation.





Complete cycle of machining operations on B. and M. Diesel car wheel: Bore A; Turn Radius B; Straddle face C-D; Semi-finish bore A; Semi-finish E-F; Cut 20° angle, upper F; Finish turn E-F; Cut 45° angle G to D; Finish face D; Finish bore A; Chamfer bore H; Finish ¾" rad. B-J; Finish 13.000" dia. B-J; Face rim K; Cut wear limit groove M.

HOW A NEW CLUTCH DESIGN



Sturdy, quick-acting drum-type brake is spring-engaged and air-released automatically—assures safe operation.

Oversize flywheel operates on average press production with a maximum of 15% slowdown.

Heavy cross-sectional friction discs float in lightweight retainer, which is keyed to drive shaft. No rivets to cause trouble—long life assured.

Pump-driven lubrication system circulates clean, filtered oil to each bearing, *including flywheel bearings.*

Clutch-operating diaphragm eliminates air cylinder packings, is not subject to wear, gives long trouble-free service.

Rugged steel drive shaft, heat-treated and precision ground, runs smoothly and accurately in anti-friction bearings.

Flywheel housing can be completely disassembled and friction discs replaced in a few minutes. Other parts subject to wear are easily accessible.

Strong herringbone pinion gear is precision cut and continuously lubricated to insure long life.

Fully stress-relieved frame provides rigid support for rotating members.

Air ventilating feature insures safe, uniform operating temperature . . . prevents overheating of discs and brake.

other DANLY features

**Results of a 1½ year performance test.*

- Sound, Clean Welding
- Precision Machining
- Rigid Enclosed Construction
- Stress Relieved Weldments
- Accurate Alignment
- Circulating Filtered Lubrication System

these features give you

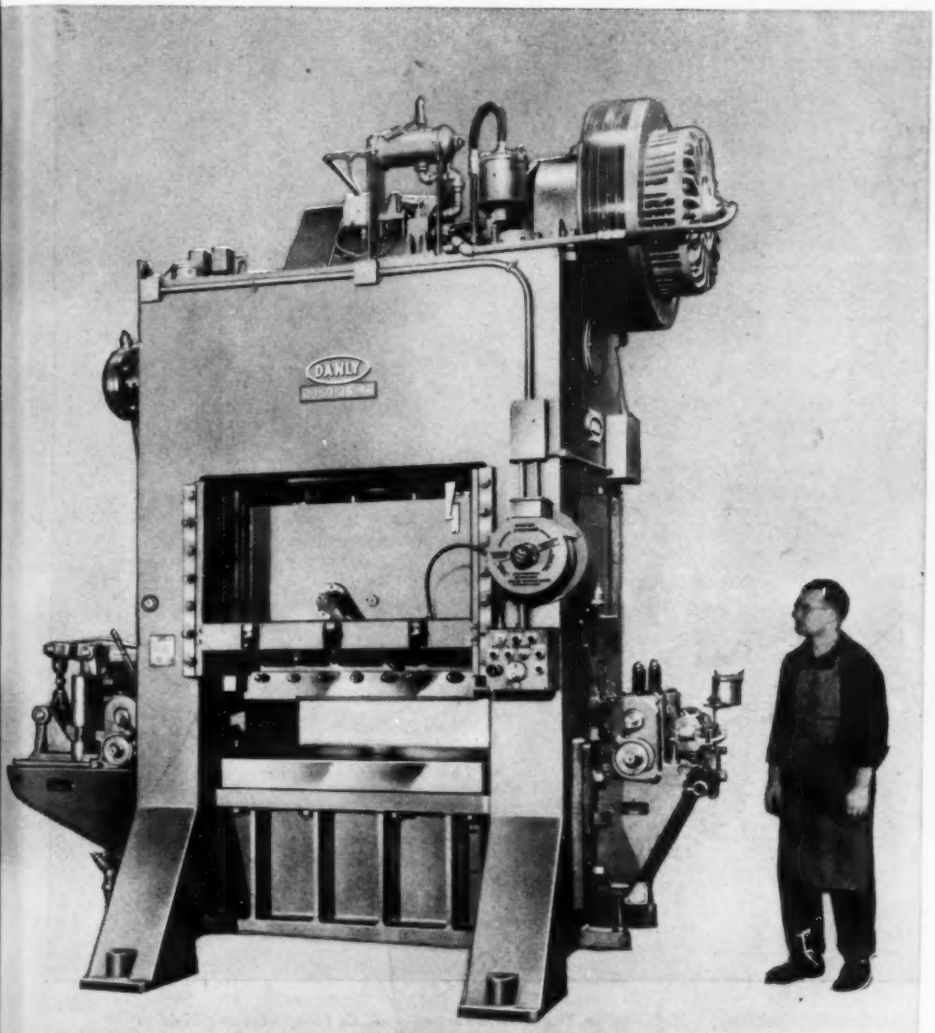
- Safe Operation
- Accurate Stampings
- Less Tool Wear
- Simplified Maintenance
- Ease of Operation
- Accessibility

DANLY

PRECISION DIE SETS...STANDARD AND SPECIAL

REDUCES DOWN-TIME...
STEPS UP PRODUCTION EFFICIENCY ON

DANLY PRESSES



* 8-Million Continuous Clutch Engagements Under Load with Negligible Wear

WRITE FOR MORE FACTS TODAY!

Main Mass of Clutch Rotates with Flywheel to Decrease Clutch Wear

The Danly Clutch and Flywheel Assembly described here is one of the several outstanding engineering features of Danly Presses which are reducing press down-time and stepping up production efficiency.

In designing the clutch and drive shaft assembly, Danly engineers effected a substantial reduction in the load picked up in the clutching operation.

How it is Accomplished

Most of the mass of the clutch is assembled *directly to the flywheel* and rotates with it. The clutch housing is also a ventilating fan which draws off the small amount of heat generated by the clutching action. The *friction discs and their retainer are the only actual clutch members which must be picked up by the flywheel* upon clutch engagement. This mass is approximately 1/7 that of conventional clutch designs. It is this factor which reduces the amount of wear on the clutch and increases production efficiency through less down-time.

engineering service... For assistance in determining the most efficient press for your production call on Danly engineers. Send details about your problems. Without obligation, you will receive specific recommendations.

get this folder

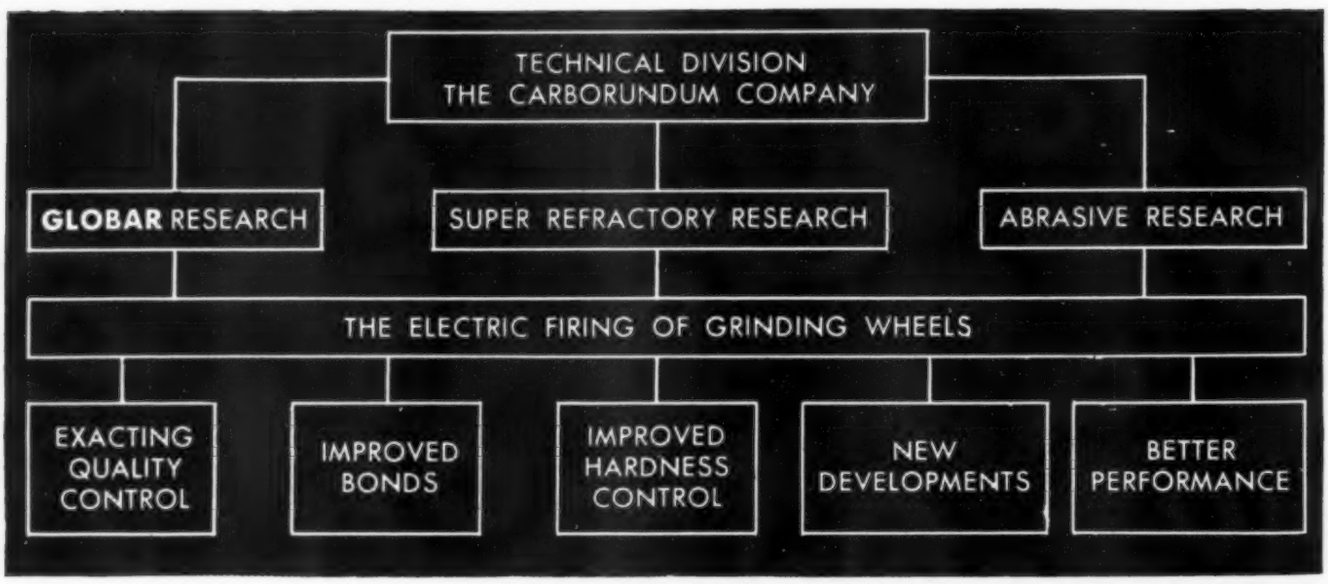
Write *today* for facts about other Danly Press features which are especially engineered to reduce down-time and step up production efficiency. Standard presses are available in capacities from 100 to 3000 tons. Write for this folder.

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

MECHANICAL PRESSES AND PRESS EQUIPMENT

THE TEAM WHICH HAS DEVELOPED ELECTRIC FIRING, AND THE "SCORE" IT HAS PRODUCED

B. A. Bovee, GLOBAR Division E. Hediger, GLOBAR Division H. C. Martin, Technical Director D. G. Foot, Abrasive Division
I. M. Logan, Refractories Division P. H. Walker, Abrasive Division



HERE IS NEWS you should have

ANNOUNCING
the electric firing of vitrified grinding wheels

As a user of abrasives, you are the direct beneficiary of a sensational improvement in the production of grinding wheels. As the leading name in abrasives it is natural that the first news of this process should come from us.

Out of a long period of experimentation, the electric firing of grinding wheels has been brought to the level of large-scale production. The benefits to you are five-fold.

1 EXACTING QUALITY. By electric firing, many factors are eliminated which heretofore jeopardized strict production requirements. Our electric kilns assure a firing curve that would satisfy the most demanding furnace foreman and contribute to a steady production of perfect wheels.

2 IMPROVED BONDS. Electric furnace procedure provides considerably more latitude in the development and selection of bonds for vitrified abrasive wheels.

3 BETTER HARDNESS CONTROL. Improvements in product quality, which are permanent standards of CARBORUNDUM engineering, have been combined with more efficient production techniques. By means of this new firing method, duplication of wheel quality is controlled to an exact degree.

4 NEW DEVELOPMENTS. An advancement of this kind will naturally encourage and stimulate our technicians. We confidentially expect to announce startling improvements in abrasive products soon.

5 BETTER PERFORMANCE. Abrasives—as good as they are...are being improved continuously. And our technical parade will continue to advance, producing better abrasives for American Industry, which in turn is producing better products and services for the world.

Only the combined resources of The Carborundum Company could effect the achievement. Electric firing of such accuracy calls for GLOBAR electric heating elements. A kiln which operates at such exacting temperatures demands CARBOFRAX and MULLFRAX super refractories.

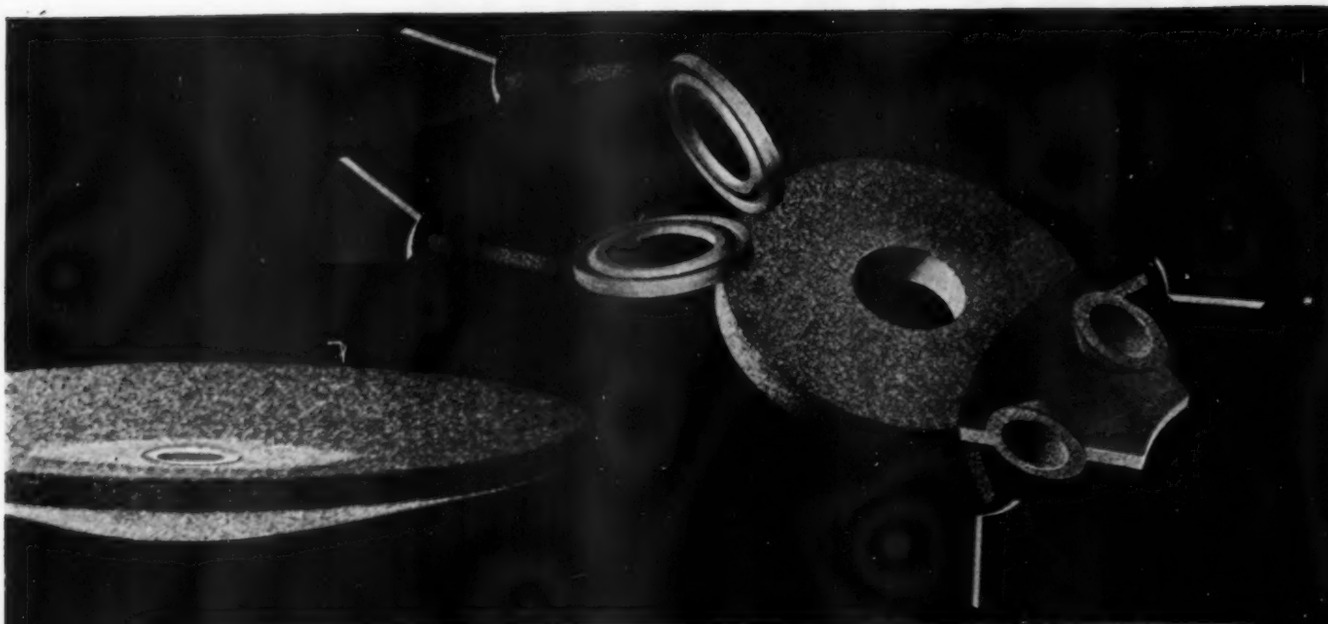
This is a technical development of large proportions. It could be brought to fulfillment only by a Technical Division with the capacity and facilities for turning up new knowledge in the fields of chemical, electrical and abrasive engineering. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM

TRADE MARK

BONDED ABRASIVES • COATED ABRASIVES • HEATING ELEMENTS • SUPER REFRACTORIES • GRAIN

"Carborundum," "Globar," "Carbofrax" and "Mullfrax" are registered trademarks which indicate manufacture by The Carborundum Company.



Want to see your grinding costs take a dive?

Are your grinding costs as low as you'd like?

Even if they seem to be *reasonably* low, the chances are that Peninsular can drop them even *lower!*

Not by furnishing inexpensive stock wheels: purchase-price savings are false economy. Peninsular helps your costs take a dive by supplying the *right* wheel, custom-tailored to every job.

Peninsular savings come to you through efficient operation. By reducing wheel wear, lowering dressing time and increasing stock removal, Peninsular brings you consistent savings with every spin of the wheel.

That's because every Peninsular recommendation is backed by a thorough examination and analysis of your grinding problems—the materials you grind, the machines and methods you use, the finishes you need. Every Peninsular grinding wheel is *individually engineered* to do its specific job.

When may one of our engineers call on you, and show you, where and how Peninsular wheels can lower your grinding costs?

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

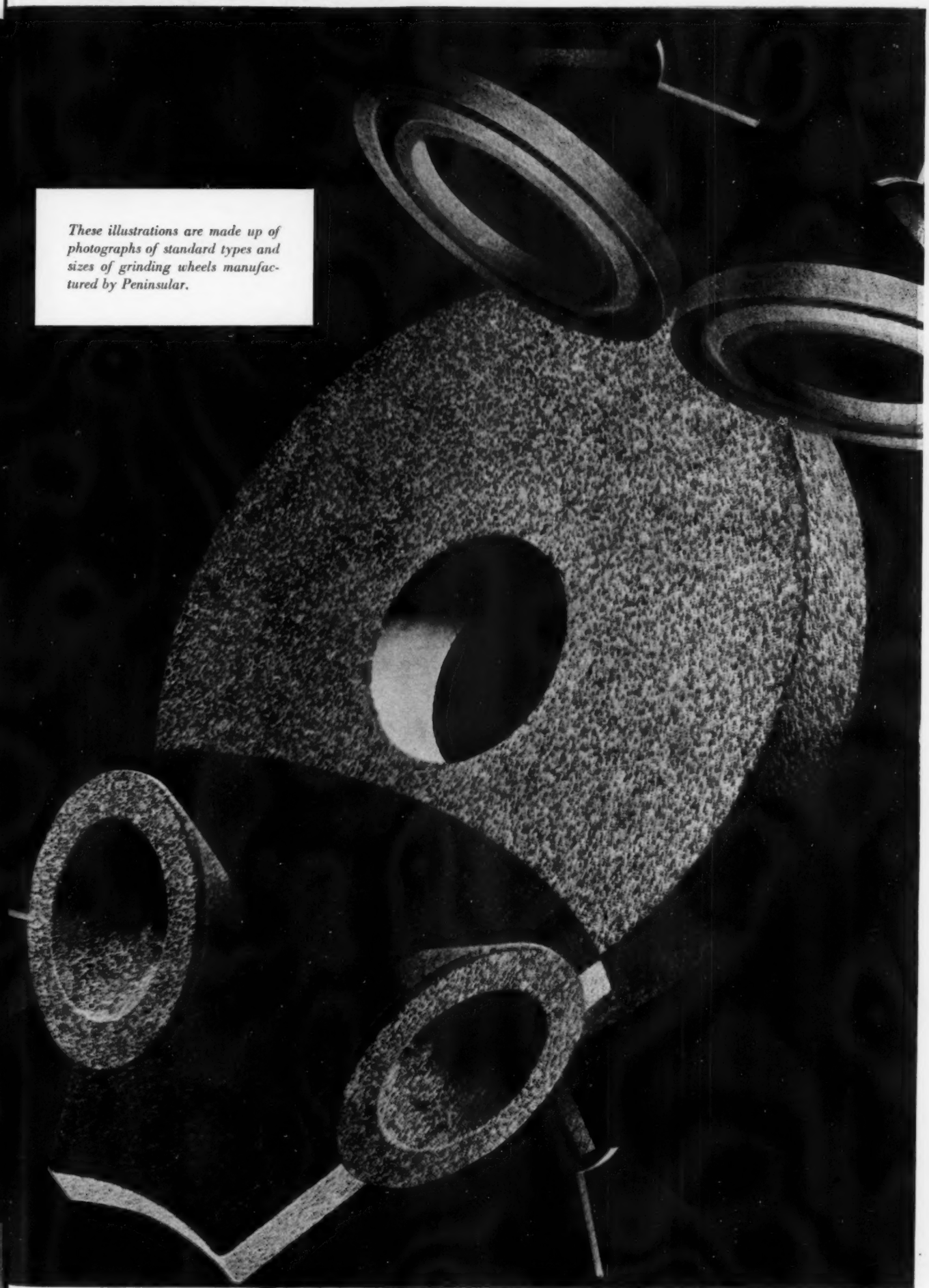
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



These illustrations are made up of photographs of standard types and sizes of grinding wheels manufactured by Peninsular.

SUPERFINISH could have prevented this!

Enlargement shows a scored and galled surface of a 3½" O.D. bearing that "froze" and failed. Had this surface first been Superfinished, it would have had nearly twice the load-bearing capacity and about three times the life. "Wear and Surface Finish," is a new textbook on Superfinish. Write for it on your company letterhead.

GISHOLT MACHINE COMPANY
Madison 3 • Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

What's in
VERMONT
this month?

SPECIAL MACHINE FINISH GRINDS INJECTION NOZZLE. Finishing fuel injection nozzles presents a unique group of internal grinding problems. The parts, as a rule, are small and demand extreme accuracy. There are three surfaces to be traverse ground and each one presents its own problem. First, the main bore, which is only .2363 inch in diameter has a seven to one ratio of diameter to length. Second, the tapered seat located at the bottom of this bore is to be traverse ground to an angular tolerance of one minute. Third, the .0394-inch hole, because of its extremely small size, demands grinding wheel speed far in excess of anything previously available. Fourth, a one-tenth concentricity is to be maintained on all three surfaces.

The Bryant Chucking Grinder Co. of Springfield, Vermont, has developed the No. 107-AW internal grinder for finishing injection nozzles at one chucking. Outstanding features include preloaded ball bearing slides for rigidity, an auxiliary angular slide for traverse grinding the tapered seat, Hi-Frequency wheelheads for speeds up to 100,000 r.p.m., and a precision workhead indexing from one wheel to the other to maintain con-

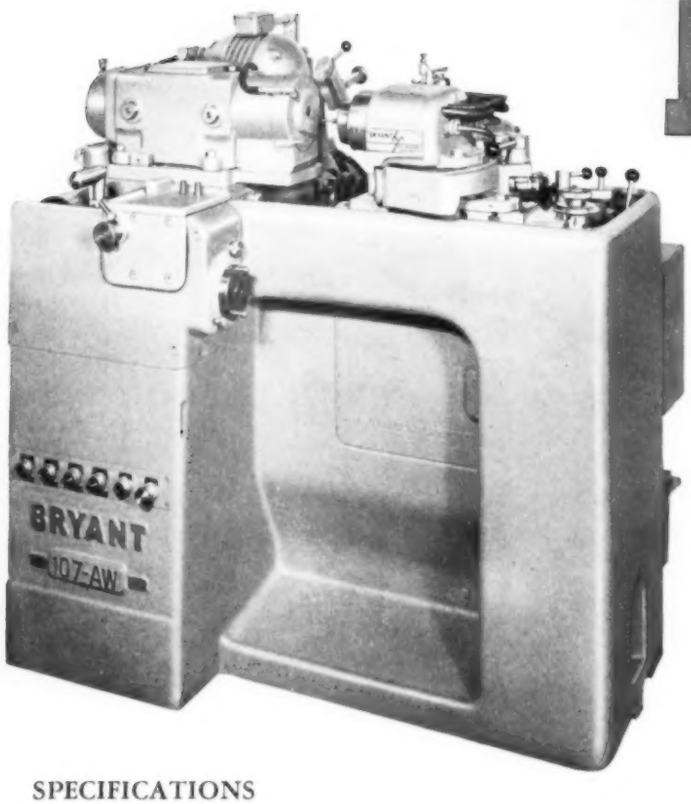
centricity. Some specifications for this machine may be found on the back of this page. For more complete information, arrangements will be made to show a 16 mm sound and color film on the No. 107-AW and other Bryant machines. . . . It won't cost to inquire.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.

BRYANT

Number 107-AW

INTERNAL GRINDER



The 107-AW is a standard machine for grinding two bores and an angular seat all on a common axis — see other side of page. Other Bryant equipment will grind holes through the complete range up to 60-inch diameter swing. Write to the factory for full information.

SPECIFICATIONS

Total swing	9 inches
Maximum traverse	6 inches
Maximum hole depth	3 inches
Angular slide adjustable from 25° to 45°	
R.P.M. of work spindle	up to 5,000 R.P.M.
Net weight	3,200 lbs.
Floor space — 60 inches x 50 inches (with coolant tank)	

SLIDES
Preloaded ball slides for cross, longitudinal and auxiliary angular motion.

WORKHEAD
Ball bearing spindle. Variable speed electric drive, to 5,000 R.P.M

WHEELHEADS (Two)
Ball bearing, Hi-Frequency, speeds up to 100,000 R.P.M.

TRAVERSE
Mechanical, powered by variable speed electric motor.

CROSS FEED
Powered by variable speed electric motor.

POWER
Standard A.C. current.

THE BRYANT SQUARENESS-OF-FACE GAGE not only shows acceptability of threaded parts, but also visually indicates the right angularity of the face with the pitch diameter of the thread. The squareness-of-face gage may be mounted on any Bryant bench gage.

You can *"See the Difference"* with a BRYANT GAGE

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

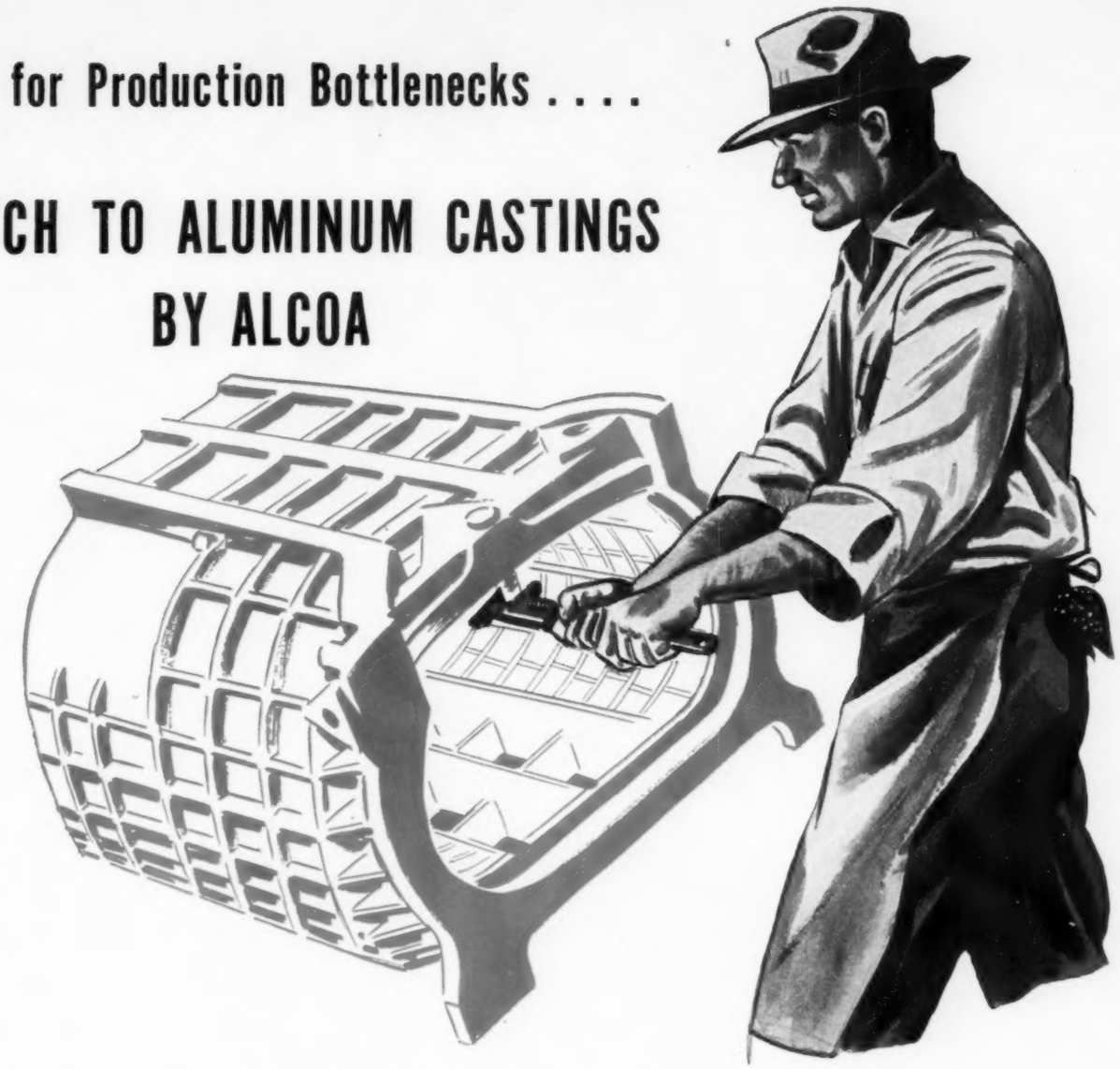
It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

Send samples or drawings for a complete story on how Bryant can save inspection money for you.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.

Rx for Production Bottlenecks . . . .

SWITCH TO ALUMINUM CASTINGS BY ALCOA



Deliveries are prompt on Alcoa Aluminum Castings. Our 10 modern castings plants from New England to California can feed castings to you on schedules you require to run production lines at full capacity.

In many cases, finished parts cost less in aluminum than in the heavy metals. And you pile up savings all along the production line.

Aluminum castings are light to handle in your shop . . . generally about ½ as heavy as iron castings . . . can be hand-lifted into position on machine tools without costly waits for cranes. Customers will like the lighter weight of your product in aluminum, too.

Aluminum castings often require less finish machining . . . and machining goes faster.

You can save on paint, too. For many parts, aluminum castings require no paint to keep them bright and shining. And they *never* show red rust.

Ask us for prices on Alcoa Aluminum Castings. You'll be amazed. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in 54 leading cities.

ALCOA CASTINGS PLANTS AT **BRIDGEPORT, CONN. • CLEVELAND DETROIT • GARWOOD, N. J. • CHICAGO • LOS ANGELES**

Aluminum Castings *by* ALCOA

ALCOA ALUMINUM

SAND • DIE PERMANENT • MOLD

CUT HEAVY *and* LIGHT STOCK *Both*

NIAGARA

You don't have to adjust knife clearance on Niagara Power Squaring Shears every time you cut a different thickness of stock! Niagara capacity ratings are maximum capacity ratings, and they cut any thickness of stock up to their top rating WITHOUT TINKERING WITH THE KNIFE ADJUSTMENT.

And to prove it, look at the photograph at right...one man is cutting a 20 gage sheet and the other is cutting 5/8" plate BOTH AT THE SAME TIME, AND WITH THE SAME KNIFE ADJUSTMENT, AND WITH THE SAME GOOD RESULTS.

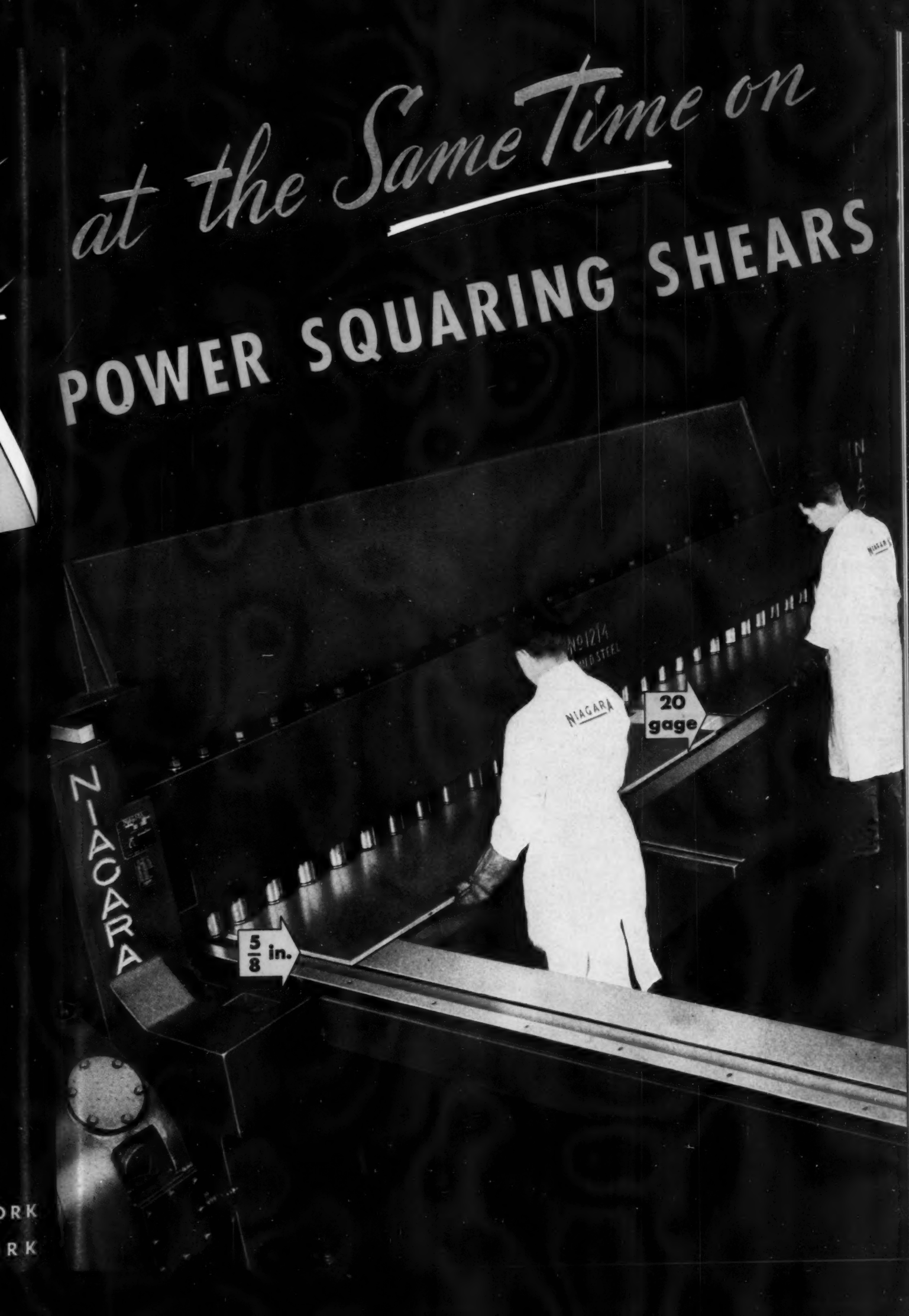
This is done daily in our own plant on our own work. We gladly demonstrate.

It speaks for Niagara design, Niagara rigidity, Niagara strength and the recognized ability of Niagara shears to deliver more working strokes per hour.

Write for bulletin.

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK


at the Same Time on
POWER SQUARING SHEARS
NIAGARA
NIAGARA
20 gage
5/8 in.

GTD BUYS AMPCO

CABLE ADDRESS
"GETEDE"
GREENFIELD MASS.
U.S.A.

SUBSIDIARIES
THE GEOMETRIC TOOL COMPANY
NEW HAVEN 15, CONN.
AMPCO TWIST DRILL CORPORATION
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GREENFIELD TAP AND DIE CORPORATION

TAPS, DIES, GAGES, SCREW PLATES, TWIST DRILLS, REAMERS, END MILLS, PIPE TOOLS

GREENFIELD, MASSACHUSETTS
UNITED STATES OF AMERICA

TO OUR CUSTOMERS:

"Greenfield" is pleased to announce the purchase of the Ampco Twist Drill Corporation of Jackson, Michigan.

Ampco is a well-known maker of twist drills, reamers and end mills. It will be operated as a division of the Greenfield Tap and Die Corporation under the management of Frank J. Sikorovsky, President of Ampco.

The trademark GTD-AMPCO will be used on tools manufactured by this new division.

With the acquisition of Ampco, "Greenfield" will now be in a position to offer distributors and consumers a more complete line of high quality cutting tools and gages as well as finest engineering service on taps, dies, drills, reamers, end mills and gages.

Very truly yours,

GREENFIELD TAP AND DIE CORPORATION

D. G. Millar

President

DGMillar:G

Special Taps? YOU BET!

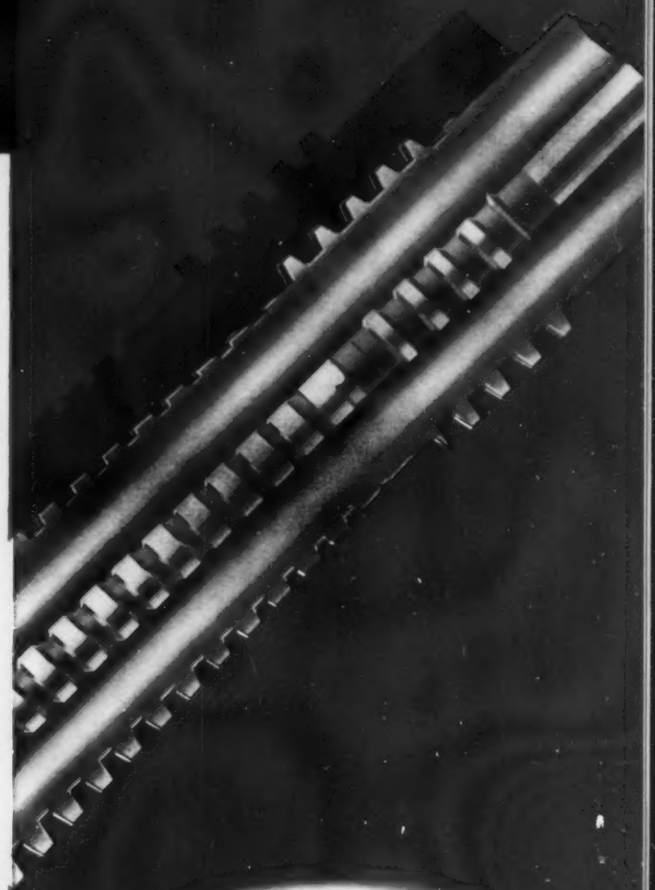
The tap user who needs a type or size not listed in the GTD Catalog can put his threading problem up to "Greenfield's" staff of threading tool engineers with complete assurance that he will get the tap that will do the job. A special thread form or pitch? A special point? An unusual shank or square? A reamer pilot? Whatever the problem, there are 75 years of tapping know-how ready to solve it, plus the ingenuity of men trained to creative engineering.

From the drawing board, your "special" goes to a new "specials" department where only specials are made; it is not sandwiched into the production schedule between lots of regular taps. Here are the latest in tap-making machines. Here are the best of the toolmaking craftsmen. Here is an inspection set-up usually found only in gage-making plants.

No matter how complicated your "special" may be, it is made with greatest speed — and at the most reasonable cost. This is the ultimate test of special tap-making ability.

"Greenfield" carries in stock hardened blanks in all standard sizes and dimensions which can be finished to special pitches or thread forms at short notice.

If you have a special tap problem, get in touch with the "Greenfield Man" through your nearest "Greenfield" distributor.



GTD

GREENFIELD

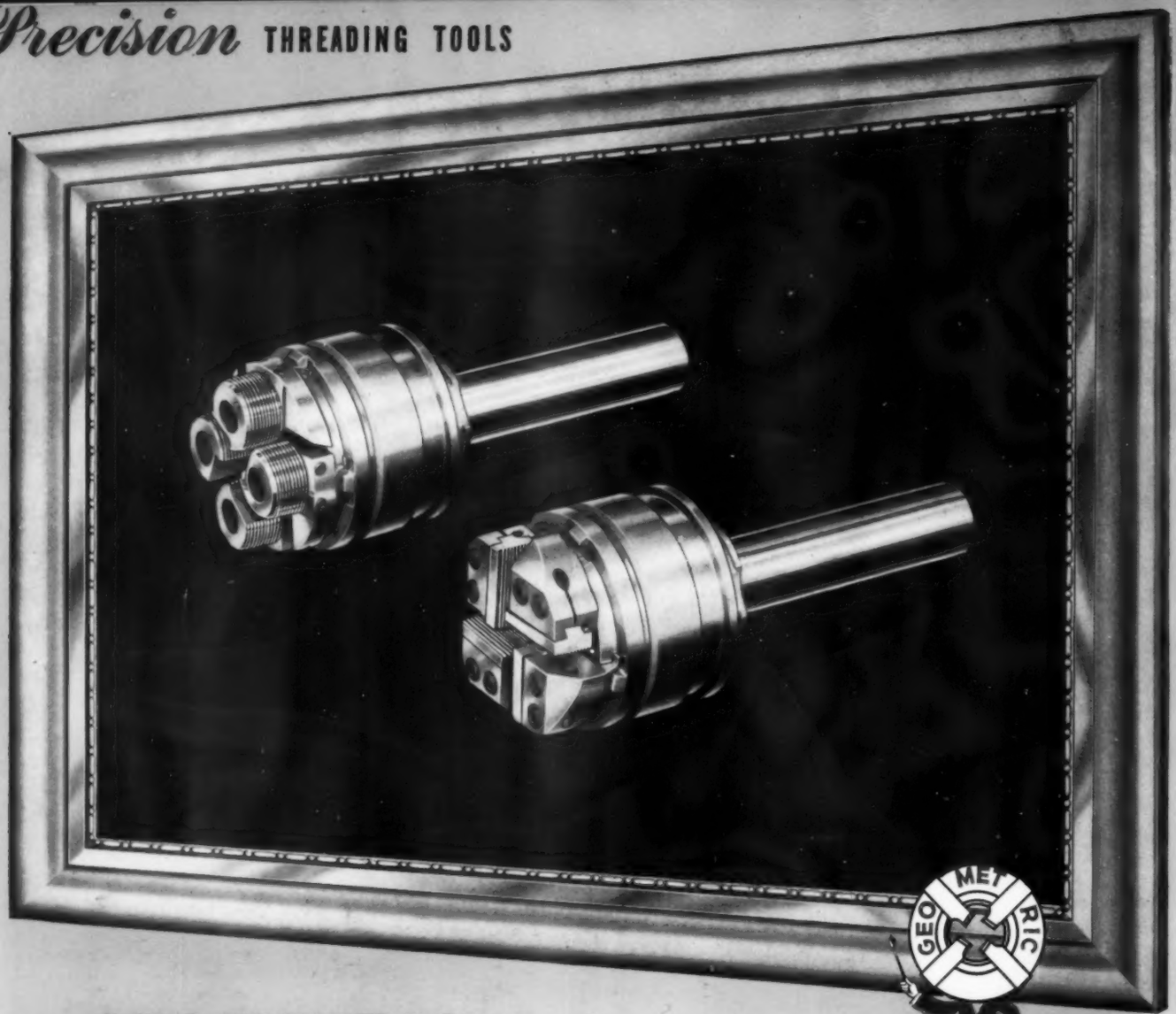
World's Leading

THREADING TOOLS

When you buy GTD "Greenfield", you get a quality of product that comes from the world's largest, most modern threading tool plant and its research staff of threading engineers—PLUS SERVICE from the leading distributors and GTD "Greenfield's" field men in every industrial center.

GREENFIELD TAP and DIE CORPORATION GREENFIELD, MASSACHUSETTS

Precision THREADING TOOLS



GEOMETRIC STYLE TR ROTARY

Combination Tangent and Circular Chaser DIE HEADS

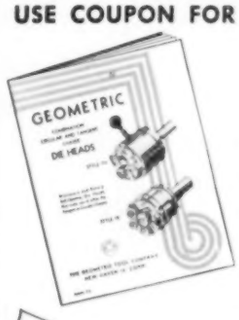
Unique Design Saves Time and Money

For those threading jobs that call for the use of either tangent or circular type chasers, this GEOMETRIC COMBINATION DIE HEAD offers several definite advantages.

First, it will accommodate Chaser Holders for both the tangent or circular type of chaser. *Second,* it has improvements in design which greatly lessen expensive down time for grinding and re-setting. It also permits threading with the greater part of the threaded surface of the chaser. Chasers and Chaser Holders can be removed without taking the head from the machine, which further reduces down time.

Finally, because of their small diameters and short over-all lengths these GEOMETRIC COMBINATION DIE HEADS will fit into the most limited spaces on any machine. Rotary Type Style TR and Stationary Type Style TH Combination Die Heads are made in three sizes with a cutting range of diameters from ⅛ to 1½ inches and are equipped with "Tangemetric" or "Circometric" Chasers and Holders, as specified. ***For complete details about the GEOMETRIC COMBINATION DIE HEADS, send today for the free bulletin on this line.***

USE COUPON FOR FREE INFORMATIVE BULLETIN NO. T-3



THE GEOMETRIC TOOL COMPANY
7 Valley Street
New Haven 15, Connecticut

Please rush me a copy of Bulletin No. T-3 which describes in detail the many advantages of the Geometric Combination Die Heads.

Name _____

Firm _____

Street _____

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City _____ *Zone* ____ *State* _____

GEOMETRIC

TOOL COMPANY

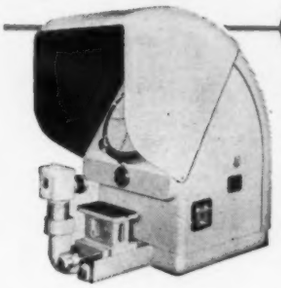
Four more to choose from

The New Jones & Lamson BC-14 Bench Optical Comparator, with 14" diameter screen, offers you a choice of four different table assembly combinations. This enables you to choose the model best suited to your needs, and obtain... *AT LOWEST COST... THE FINEST IN OPTICAL COMPARATORS.*

These models provide a larger lens field and a larger screen area than the smaller bench models. They are designed to cover an almost unlimited range of inspection work—they provide a means of inspection that is accurate, rapid and economical. Costly gages can be dispensed with, costly time saved and quality improved.

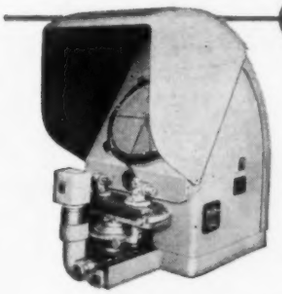
Many components and products formerly inspected by slow, tedious methods that retarded production and drained profits, are now inspected in a matter of seconds or minutes on Jones & Lamson Comparators, with consequent savings all along the line.

Our engineers are inspection specialists; their knowledge of holding fixtures, handling methods and suitable Comparator equipment, qualify them to study your inspection problems and make recommendations that will improve your profit picture. They have for others. Call, write or wire for their service today.



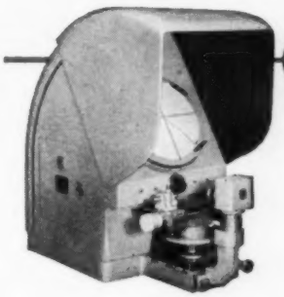
1 Model BC-14A

This model has a platform type table 5 x 10" for inspecting, by comparison, a large variety of objects on a production basis. The top of the table is 5" below the center of the lens system to provide ample space for various work holding fixtures. Magnifications range from 10 to 100.



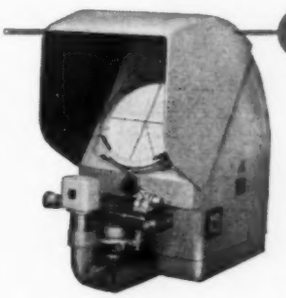
2 Model BC-14B

This model has a 16" table that can be compounded for inspecting objects with helices. The table can be elevated vertically 1¾". It is used for inspection, by comparison, of screw threads or other irregular profiles. Objects up to 3" diameter and 11" long between centers can be inspected at magnifications ranging from 10 to 100.



3 Model BC-14C

This model has a 16" table with 2" lateral travel that can be compounded for inspecting objects with helices. The table can be elevated vertically 1¾". Objects up to 3" diameter and 11" long between centers can be inspected at magnifications ranging from 10 to 100.



4 Model BC-14D

This model is used for the complete measurement of tools, gages and products. The 16" table with 2" lateral travel can be compounded for inspecting objects with helices. It can be elevated vertically 1¾". The chart ring is graduated in degrees and minutes and the handwheel is graduated in .0001". Objects up to 3" diameter and 11" long between centers can be inspected at magnifications ranging from 10 to 100.

Jones & Lamson
OPTICAL COMPARATORS

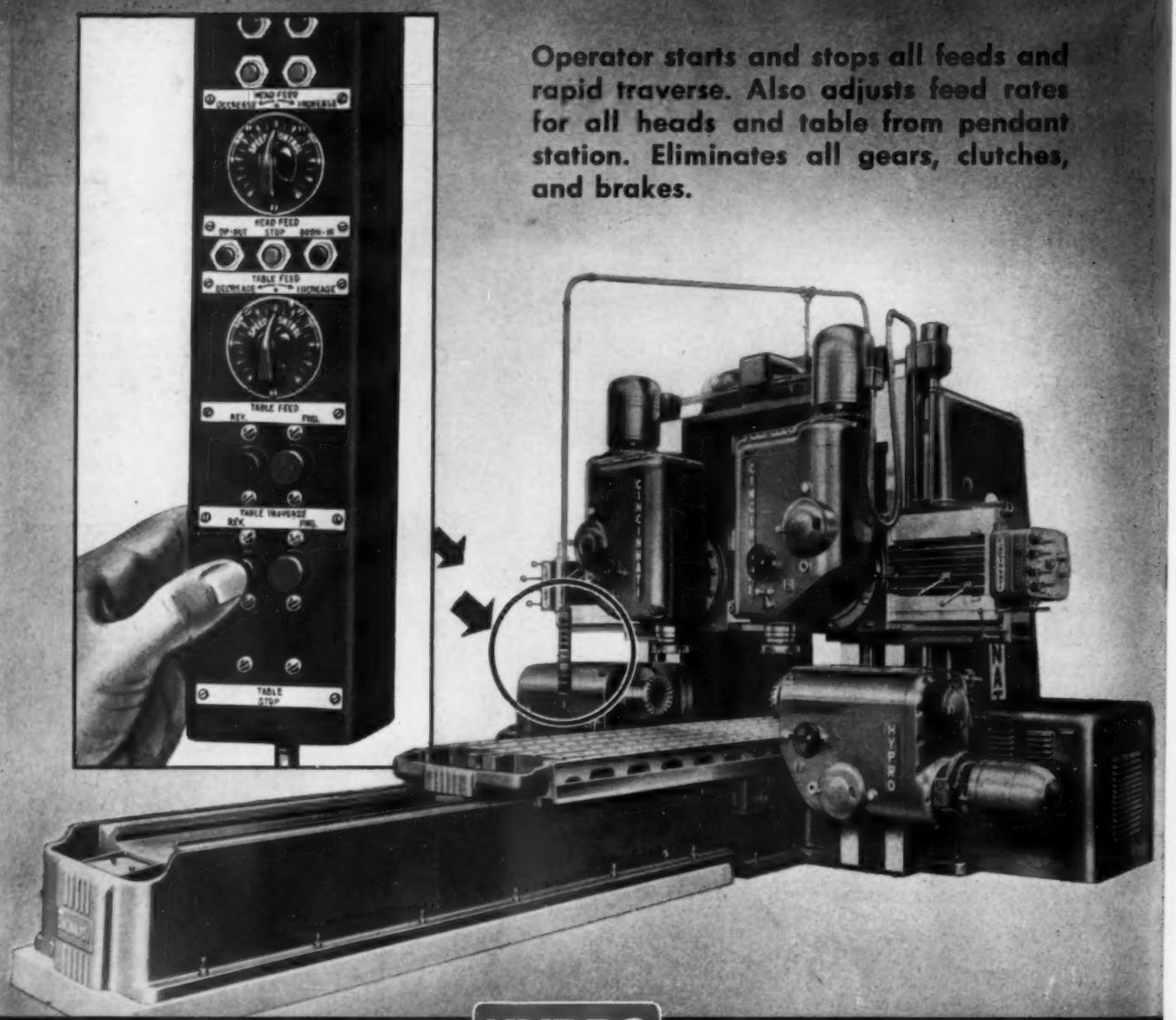
JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

AN ENTIRELY **NEW** DEVELOPMENT...

Hypro·electronic

PLANER MILLER DRIVE



Operator starts and stops all feeds and rapid traverse. Also adjusts feed rates for all heads and table from pendant station. Eliminates all gears, clutches, and brakes.

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

Only M & M builds ALL 3: CIRCULAR SAW SAW BLADE BLADE GRINDER

CLIMB MILLING PRODUCTION!

NOT SO EASY TO GET WITH CONVENTIONAL METHODS, BUT COMMON PRACTISE WITH MOTCH & MERRYWEATHER

Slitting Saws

Triple-Chip METHOD

The M. & M. Triple-Chip tooth contour and dual drive adaptors make climb milling profitable in slitting operations.

STRAIGHT, ACCURATE SLOTTING FOR LONG LENGTHS

The Motch & Merryweather Dual Drive renders saw keyways unnecessary giving positive, equalized driving power.

Higher production fully realized with greater accuracy,—that's the rule with climb milling when performed with M. & M. Slitting Saw Blades. The teeth cut in the direction of the feed. Motch & Merryweather Slitting Saw Blades give you the rigidity essential to today's stiff production requirements through our exclusive Triple-Chip tooth form, which imparts extra strength and breaks up the chip load. Dual drive adaptors deliver equalized transmission of power. A straight, accurate cut makes possible a deep, thin slot without danger of breakage. Better finish is another valuable result.

Ask for our Bulletin "A-7"

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

FRACTIONAL HORSEPOWER GEARING

GET *HIGHER STANDARDS* OF UNIFORM ACCURACY IN THE SIMPLE, LOW COST, SMALL GEARS YOU BUY

If there was ever a *versatile* organization in the mass production of BETTER Small Gears . . *this is it!* For, G.S. facilities are equally well adapted to making *simple, low cost forms of Fractional Horsepower Gearing* as they are to producing the finest and most intricate close-tolerance jobs!

So, get the benefit of highly specialized G.S. "know-how" on the less costly small Gears you need. Enjoy the inevitable *plus-values* built into every G.S. Gear . . values that give greater uniformity, accuracy, economy, longer and more satisfactory performance. Ask a G.S. Small Gear specialist for ideas, suggestions, and cost estimates. There is no cost or obligation involved.

SEND FOR THIS FREE CATALOG-BULLETIN

The G.S. Gear Bulletin illustrates and describes many different types and applications of G.S. Small Gears. It offers valuable aid to anyone concerned with specifying Gears 12 D.P. and finer. Ask for it on company stationery, please.

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

ALL HOLES
PIERCED EVERY
7 SECONDS

HYDRAULIC HOLE PIERCING SYSTEM

speeds refrigerator door production

For example, Vulcan's Hydraulic and Electrically controlled Piercing System perforates all holes in the flange of a refrigerator door every seven (7) seconds. Frees four (4) punch press operations, eliminating multiple die costs, labor and maintenance. Quickly adjusted for any door sizes, lefts or rights. One operator. No punch presses needed.

Increases Production
Saves floor space
Frees presses for
other work

The hydraulic principle for Die Operation can be utilized in many forming and piercing applications. Upon receipt of your product part prints we will gladly advise and quote. No obligation.

Vulcan Tool Co.
DAYTON 10, OHIO, U. S. A.
COMPLETE TOOLING PROGRAMS

These Bolts are too brittle

These Bolts are too soft

These Bolts are just right

Circle Ⓑ Bolts and Nuts . . . both standard and special . . . are carefully inspected for size and strength. Their dependability is a definite asset to products on which they are used.

BUFFALO BOLT COMPANY
North Tonawanda, N. Y.
SALES OFFICES IN PRINCIPAL CITIES
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...they are CIRCLE Ⓑ BOLTS

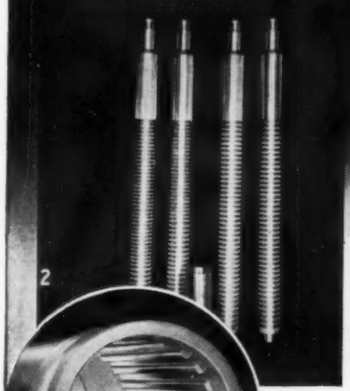
FOR BROACHES

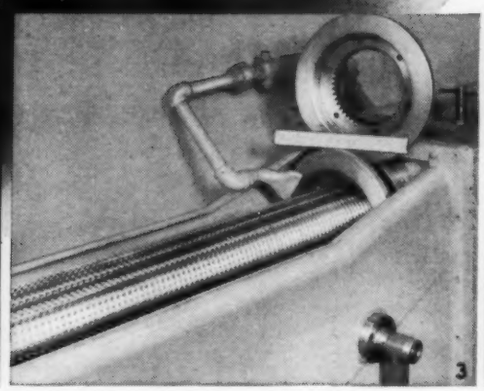
and for ALL Your Broaching Needs

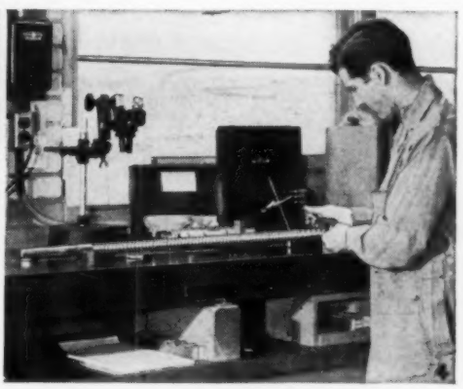
SEE *American* FIRST

You are sure of greater satisfaction when you buy broaches from *American*. This is because of *American's* broad experience in all phases of broaching—machines, tools, fixtures, and engineering. This all around experience assures you of broaching tools that will give exceptionally long life at low initial cost.

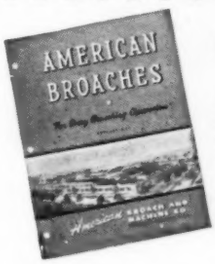
See *American* first for all types of broaches: surface, round, spline, serration, hex, square, and formed broaches in any required size. *American* also manufactures pull and push heads for broaching tools of all sizes. And see *American* first for *everything* in broaching—machines, tools, fixtures, and engineering.







(1) Grinding a spline broach. All *American* broaches are ground by skilled broach makers to exceptionally close tolerances. (2) These four broaches, used in succession, cut 24 angular splines in steel airplane landing gear struts. Broaches are 65" long, and cut a spline section 12⅛" long by 4¼" I.D. Inset shows broached interior of part. *American* manufactures broaches of every size and variety, for the metal working industries. (3) This large broach, in a standard *American* H-30-72 Horizontal Broaching Machine, cuts 46 involute spline teeth in a bevel gear part. Size of broach is indicated by 12" rule shown with broached gear part placed on top of machine. (4) Checking a spline broach for spline width in *American's* Broach Inspection Department. Every broach must pass rigid inspection before shipment.



WRITE FOR CATALOG NO. 144

Contains complete description of different types of broaches and machines. Tells uses of each. Gives information on care and maintenance of broaches, specifications of standard broaches, and other useful facts. No obligation. Write for your copy today!

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

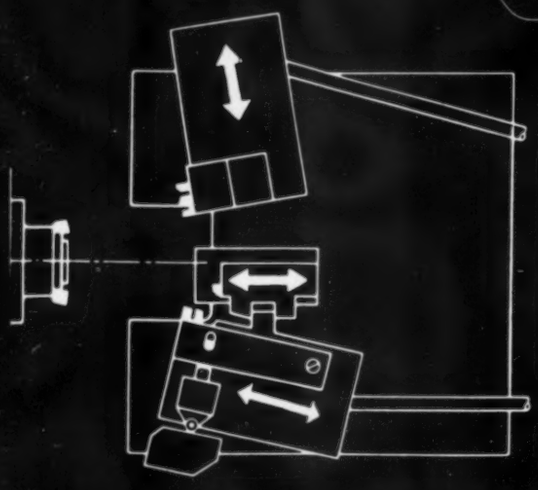
•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

the GISHOLT SIMPLIMATIC

Works All the Angles...



COMPLETE FREEDOM IN PLACING TOOL SLIDES

...enables you to meet your own specific needs for high-speed automatic machining . . . and do it with a standard machine.

THE SIMPLIMATIC's large platen table provides a platform upon which tool slides may be mounted in any position. Above is a typical tool layout—designed for machining bevel gear blanks. Angular feeds are no problem. Compound slides are seldom needed. Write for literature.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round or partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

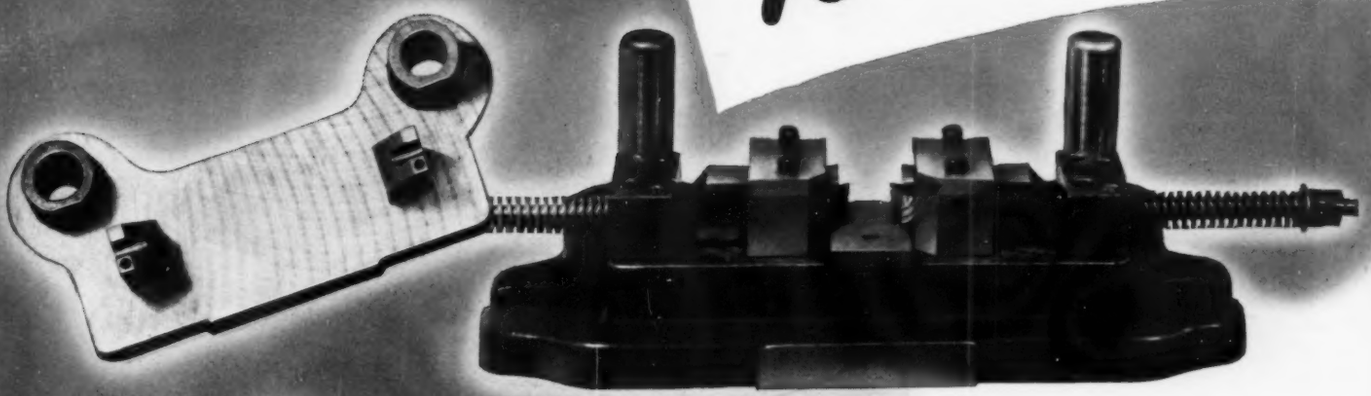
Madison 10, Wis.

TURRET LATHES · AUTOMATIC LATHES
SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

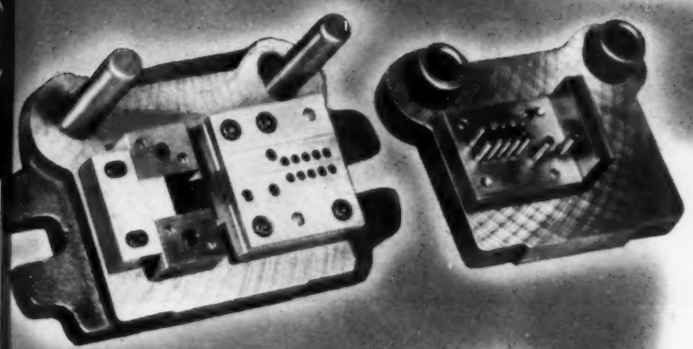
BTR

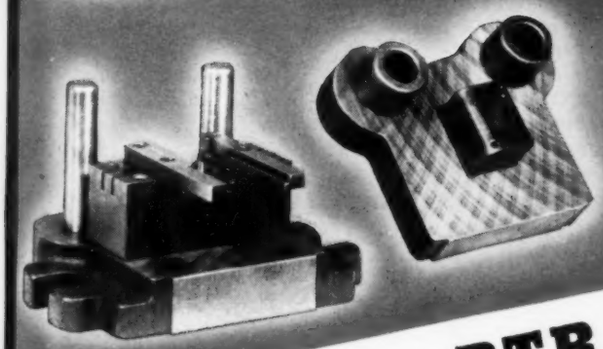
BETHLEHEM TOOL ROOM

The Safe-hardening TOOL STEEL



Squeezing, punching, and forming dies made from BTR. This general-purpose tool steel is a dependable choice for a wide range of tools and dies.





BTR . . . one of our most popular grades . . . is a great deal more than just an "oil-hardening" tool steel. Though often selected primarily for its safe-hardening characteristics, BTR is a favorite with toolmakers because . . .

It is easy to machine and heat-treat
It is high in both wear- and shock-resistance
It has low distortion in heat-treatment

BTR is backed by years of making good in tool and die shops. Toolmakers have confidence in its ability to harden in oil at low quenching temperatures, without fear of cracking hazards. Important, too, is the general utility of BTR. Use it for a wide range of tool and die jobs and you'll probably find, as others have, that it replaces several grades you're now using. BTR is reliable; you can count on it.

Call your nearest Bethlehem Tool Steel distributor or Bethlehem sales office. They'll give you full details and arrange for prompt delivery.

QUICK FACTS ABOUT BTR

	C	Mn	W	Cr	V
Typical Analysis:	0.90	1.20	0.50	0.50	0.20

Annealing: 1450 F, 202 Brinell
Hardening: 1475 F, oil-quench
Tempering: 325 to 400 F, Rockwell C 58 to 62
Toughness and Wear-Resistance: Good
Distortion-Resistance: Good
Resistance to Decarburization: Very Good
Machinability: Very Good
Application: For all general-purpose tools and dies which require a safer-hardening grade than carbon tool steel.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BTR . . . one of Bethlehem's fine tool steels

SOUTH BEND
13" Precision Lathes

Catalog No. 113-B 13" x 5' Quick Change Gear Lathe with 3 phase, 60 cycle, 220 volt, A.C. motor and drum switch; f.o.b. factory $1153.50

South Bend 13" Precision Lathes offer many advantages where close-tolerance machining is required. They are economical of power, accurate, fast, and versatile; and have capacity to handle chuck work up to 13" in diameter, and between-center jobs up to 8" x 52". Substantial savings in capital investment, floor space, and labor cost often result from their installation.

The Quick Change Gear model is popular for production operations, maintenance, and service work. The Toolroom model has sufficient capacity to handle a large variety of toolroom work—its accuracy insures perfect results. Numerous tools and attachments are available for special jobs.

SPECIFICATIONS

SWINGS: 13⅛" over bed and saddle wings; 8¾" over saddle with chip guard removed.

BED LENGTHS	4, 5, 6, and 7 feet
DISTANCE BETWEEN CENTERS	16 to 52 inches
COLLET CAPACITY	11/16 inch
SPINDLE BORE	1 inch
SPINDLE SPEEDS: Eight	34 to 875 r.p.m.
POWER LONGITUDINAL FEEDS: 48 R.H. or L.H.	.0015" to .0841"
POWER CROSS FEEDS: 48	.0006" to .0312"
THREAD CUTTING: 48 R.H. or L.H. pitches	4 to 224 per inch
CROSS SLIDE TRAVEL	8⅛"
COMPOUND REST TOP ANGULAR FEED	3⅛"
TAILSTOCK SPINDLE TRAVEL	4¼"
TAILSTOCK TOP SET-OVER	15/16"

PRICE RANGE OF SOUTH BEND 13" PRECISION LATHES

Quick Change Gear Lathes	$1054 to $1162
Toolroom Lathes	$1418 to $1494

(Prices f.o.b. factory, less electrical equipment)

Other South Bend Precision Lathes are made with 9", 10", 14½", 16", and 16/24" swings. We also manufacture Precision Turret Lathes with ½" and 1" collet capacities, and a 14" Drill Press in bench and floor models.

Write for literature on the South Bend tools. Immediate deliveries can be made and a Time Payment Plan is available.

SOUTH BEND LATHE WORKS

Building Better Tools Since 1906 • 419 EAST MADISON STREET, SOUTH BEND 22, INDIANA

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

National Bureau of Standards has a new magnetic clutch, which is intended primarily for immediate use in servo mechanisms, but has possibilities in many fields including the automotive. It consists of a driving and a driven plate immersed in oil, in which are suspended iron particles that can be magnetized or demagnetized.

get ready with CONE for tomorrow

Carnauba wax now has a rival in a substance extracted from Mexican sisal fiber, according to Armour Research Foundation.

be ready with CONE for today

Dow Chemical Co. has found a way to electroplate magnesium by first coating the metal with zinc.

get ready with CONE for tomorrow

Standard Railway Equipment Mfg. Co. has perfected a machine for truing car wheels without removing them from the trucks.

be ready with CONE for today

Greyhound Corporation's new 50-passenger, two-level bus has a crash-proof gas tank made by Firestone Tire & Rubber Co.

get ready with CONE for tomorrow

Electronic vulcanization has become a standard production process at B. F. Goodrich Co.

be ready with CONE for today

Lustron Corp. of Columbus, Ohio, has a porcelain enameled steel prefabricated house which they expect to be producing at the rate of 3700 units per month by next October.

get ready with CONE for tomorrow

Ford's light car will be made and sold in France.

Beech Aircraft Co. promises a new automobile with air-cooled engine and electric drive to all four wheels.

be ready with CONE for today

The first Conomatic multiple spindle lathe was built to accommodate carbide tipped tools almost two decades ago. The exclusive frame design of the machine remains practically unchanged today.

get ready with CONE for tomorrow

"Durisol" is the name of a new building panel made of wood shavings and portland cement by Durisol, Inc., 420 Lexington Ave., New York City.

Allis-Chalmer's new low-priced tractor pushes the tools instead of pulling them so that the farmer can see his work.

be ready with CONE for today

B. F. Goodrich Co. has announced that some of its extruded shapes are being vulcanized electronically. Time has been cut in some cases from 1½ hours to two minutes.

get ready with CONE for tomorrow

E. I. duPont de Nemours & Co. has granted licenses to 50 paint manufacturers to make its metallic lacquer finish.

be ready with CONE for today

The new Oldsmobile engines will have a compression ratio of nearly 8 to 1.

get ready with CONE for tomorrow

Kaiser-Frazer Co. announce that they are experimenting with magnesium automobile wheels.

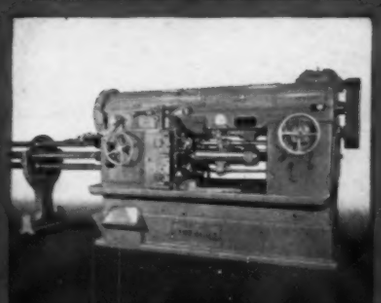
FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Profitably

CONOMATIC

TWO of these ball-bearing inner races are turned from SAE 52100 tubing, 2 5/16" O.D., 1½" I.D., in 11 seconds on the 6-spindle Conomatic.

Ask your CONE representative to show you our new color motion picture



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

52

BLISS Presses are i

Ford's

Past, Present and Futur

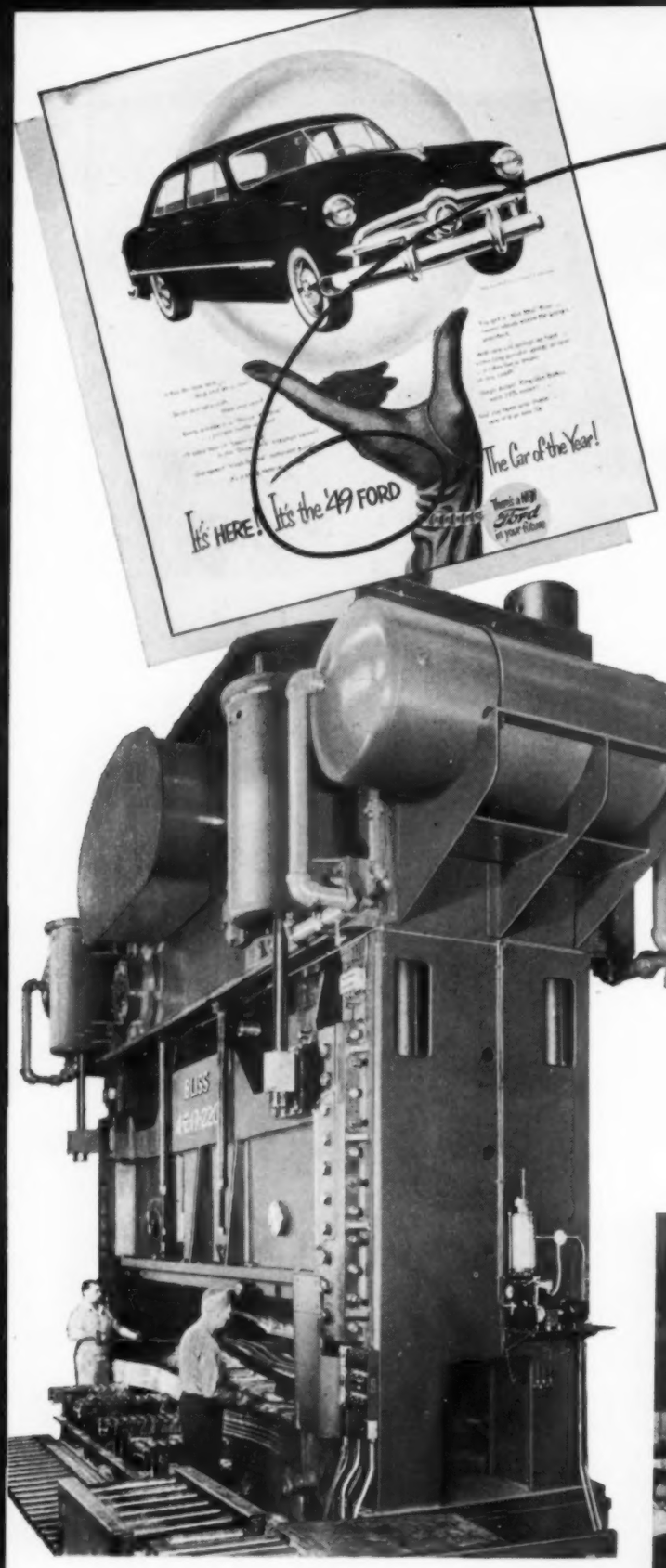
Hundreds of Bliss presses in Ford plants the country over are helping to mass-produce the thrilling new 1949 Fords, Mercurys and Lincolns. Giant forming presses are turning out body panels, and batteries of new presses, specially designed by Bliss in co-operation with Ford engineers, are stamping muffler parts, generator housings, hub caps, and hundreds of other parts.

That's how it was with the Model T and all subsequent Ford cars. Like other stampers, large and small, Ford has known for generations that "Bliss" on a press is more than a name...it's a guarantee.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Hastings, Mich.; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.



Outer side rails of 1949 Fords are formed on this Bliss 2000-ton Rail Press—measuring 220" between uprights.

Battery of four Bliss Gap Double Crank Presses riveting body brackets to outer side rail.

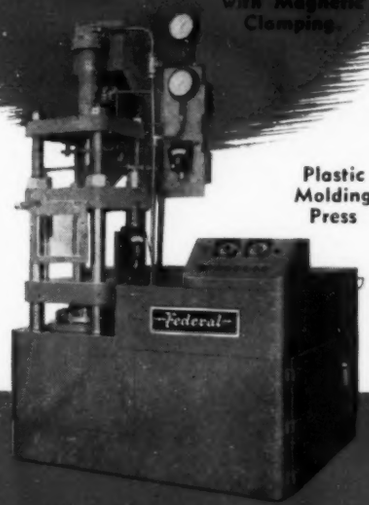
MARQUETTE · BLISS · CONSOLIDATED · TOLEDO ·
BLISS BUILT

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

A Safe Combination

Double Action Single Crank Press. Capacity 120 tons.

Federal 350 KVA 84" Sheet Flash Welder with Magnetic Clamping.



Plastic Molding Press

Your production line is the life-line of your business — give it the protection of Federal's **safe combination!** Let us demonstrate to **you** how **your** product can be made more rapidly, more economically and better in quality by installing the right Federal welder, the right Warco press, or special machines to suit your requirements.

Write or phone us today!

RESISTANCE WELDERS FOR EVERY APPLICATION
ALL TYPES OF SPECIAL MACHINERY
FROM 50-TON OBI TO 2000-TON DOUBLE ACTION

Federal WELDERS | Warco PRESSES

THE FEDERAL MACHINE & WELDER CO.
Dept. 178
WARREN, OHIO

Good production— *commercial* tolerances— LOW *labor cost*— *from a* GARDNER HORIZONTAL DISC GRINDER

WORK DATA

Part: Gear Boxes and Covers
Material: Cast Iron
Operation: Grind Top and Bottom of Box; Mating face of cover.
Tolerances: .006" to .008" for parallelism; .002" to .004" for flatness.
Stock Removal: .040" to .050 max., all faces.
Production: Top (in fixture) 40 per hr. Bottom, 40 to 50 per hr. Cover, 70 per hr.
Machine: #124-53" Gardner Grinder

FOR moderate production on dozens of average flat surfacing operations, you just CAN'T BEAT a standard Horizontal Gardner Grinder. This one is seen grinding 2 parallel faces of a gear box within good commercial tolerances, and with excellent production. Bottom face of box is ground free-hand; then in a fixture carried on a Swinging Work Table, the top surface is ground parallel. Covers also are struck off free-hand. Labor cost is low, since relatively unskilled operators can be employed. The full production story is given in the right-hand panel.

Check the possibilities of this method on YOUR WORK—

Write for Bulletin on GARDNER HORIZONTAL GRINDERS!

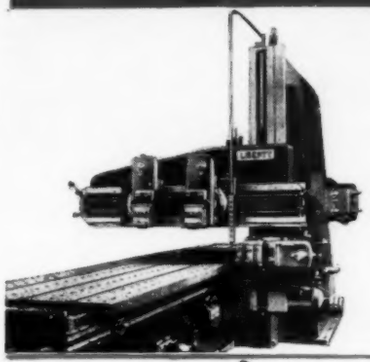
GARDNER-GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

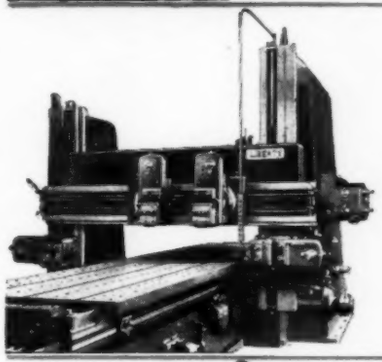
LIBERTY

BUILDS 3 *great* PLANERS



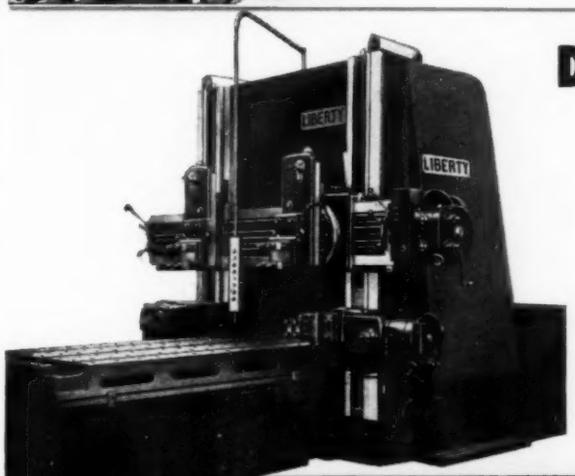
OPEN SIDE

For shops handling work of variable widths. Wide-faced housing and motorized clamp give rigidity for heavy roughing cuts and finishing. Dual control; electric feeds; rapid traverse to all Heads in all directions.



CONVERTIBLE

For exceptional rigidity on variable widths. Two, three or four heads. Offset heads permit closest approach of tools. Double balanced driving gear and pinions. Extreme accuracy.



DOUBLE HOUSING

For rapid production combined with accuracy. Two, three or four heads. Extremely rigid; handles production work with maximum cutting feeds and speeds. Table pulled into tool. Electric clamping and dual control for ease of operation; high production.

Write for catalog giving complete details.

All lengths, 24″ x 24″ wide and larger.

LIBERTY PLANERS, INC.

HAMILTON, OHIO

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 W. MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

● Now you can get a Sensitive Radial Drill for your small work—Fosdick having recently added this much needed machine to their line of Radials.

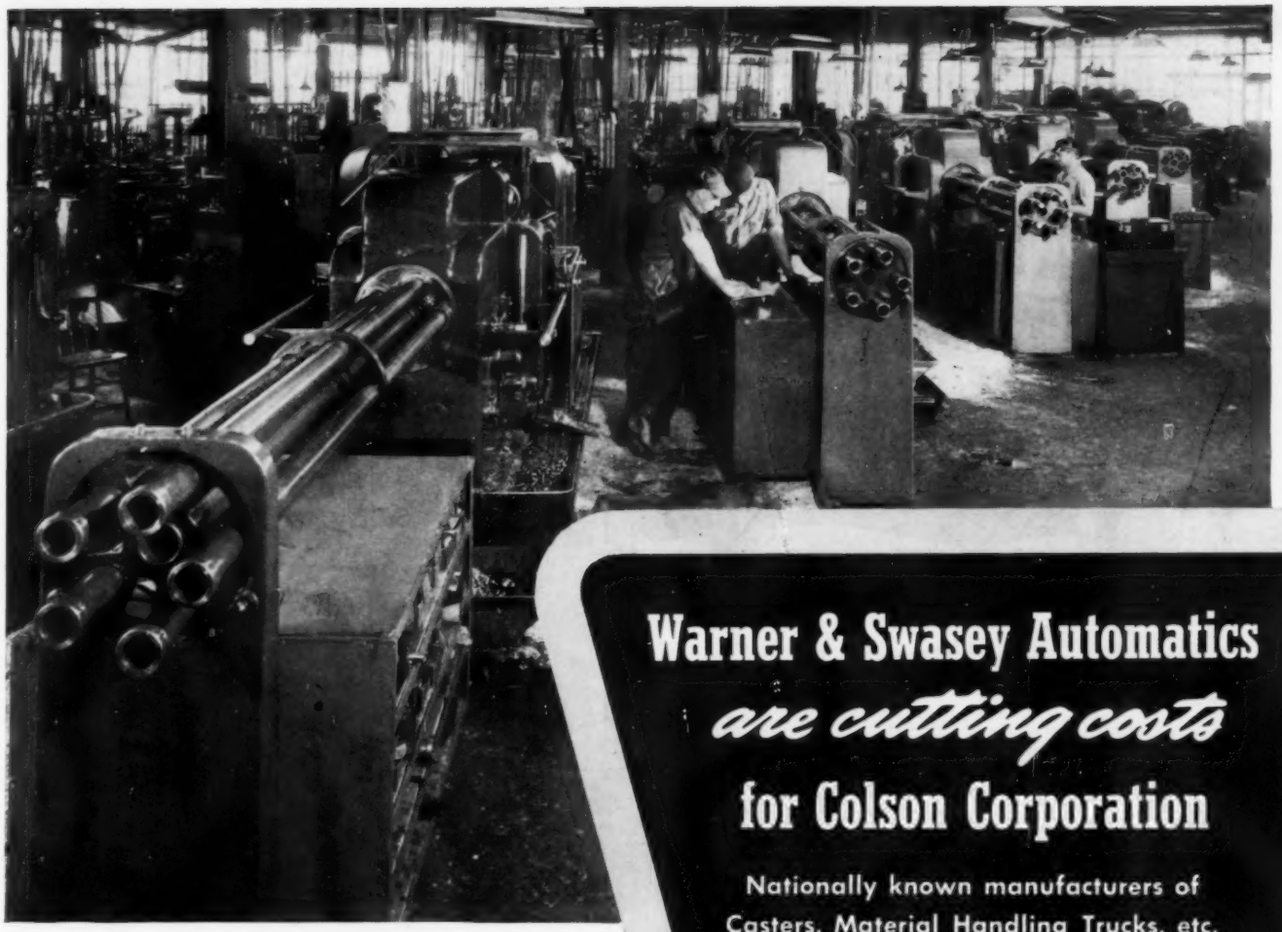
It differs in design from the conventional radial in several ways. First—the arm is at a fixed height., Second—the machine has a movable table, Third—the column is of one piece construction.

These departures offer several advantages. The arm is readily reached on all operations and both the arm and table swing in a 360° arc on the column. The table may also be raised and lowered to suit the work and is always in the proper position. The column being of one piece construction is considerably stronger.

In addition a semi-automatic tapping control of entirely new design, is available. Two adjustment dials are used, one reverses spindle at proper depth; the other returns spindle to forward rotation as soon as tap clears the work. This design eliminates necessity for returning spindle to extreme upper position before tapping next hole.

These are but a few of the many time and cost saving advantages of the new Fosdick Sensitive Radial. *Write for bulletin Fosdick Sensitive Radial R S A for complete details.*

FOSDICK MACHINE TOOL Company
CINCINNATI 23, OHIO



Five of seven Warner & Swasey 5-Spindle Automatic Bar Machines in operation at Colson Corporation, Elyria, Ohio.

Warner & Swasey Automatics *are cutting costs* for Colson Corporation

Nationally known manufacturers of Casters, Material Handling Trucks, etc.

THE COLSON STORY

- ★ Setup time cut more than 50% on new Warner & Swaseys.
- ★ Production up 7 to 8 times on lots of 500 to 10,000 pieces.
- ★ "Progressive" setups are much more practical on Warner & Swaseys.
- ★ Small lots are economically practical on this new CAMLESS Automatic.
- ★ Machine operators appreciate easy access and interchangeability of tooling.
- ★ Both management and operators approve—NO CAMS TO CHANGE.
- ★ Five repeat orders prove the profitability of Warner & Swaseys.

It's simpler to set up a Warner & Swasey CAMLESS Automatic!

WARNER & SWASEY *Cleveland*

Turret Lathes, Multiple & Single Spindle Automatics, Precision Tapping and Threading Machines

THE IDEAL ADDITION TO YOUR SHOP . . .

FIG. 732
Pat. & Pats. Pending
Drawer is extra

FIG. 1855
"HALLOWELL" TOOL STAND of steel may be had with rubber-tired casters.

HALLOWELL

READY-MADE

SHOP EQUIPMENT OF STEEL

Save yourself the trouble and expense of designing and building your own work-benches—make your choice from the popular, ready-made "Hallowell" Line, which also includes: Tool Stands, Foreman's Desks, Stools, Chairs and Trucks . . . all of sturdy steel construction. The long-wearing, splinter-proof, ready-made "Hallowell" Work-Bench of Steel is the *ideal modern addition* to your shop. "Hallowell" Benches usually have steel tops; are also available with laminated wood tops; or steel tops covered with "Tempered Presdwood". The "Hallowell" is made in standard heights, widths and lengths . . . does not require costly bolting to the floor, and can be easily re-arranged as individual units—or can be joined to form a continuous work-bench . . . a flexibility *so different* from wooden benches. Ask for *your* copy of the "Hallowell" Catalog . . . very informative and useful.

Write us for the name and address of your nearest "Hallowell" Industrial Distributor.

FIG. 2197
"HALLOWELL"
FOREMAN'S DESK OF STEEL

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 4

BRANCHES: CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

for *increased* production between sharpenings

use

BARBER-COLMAN CARBIDE TIPPED HOBS

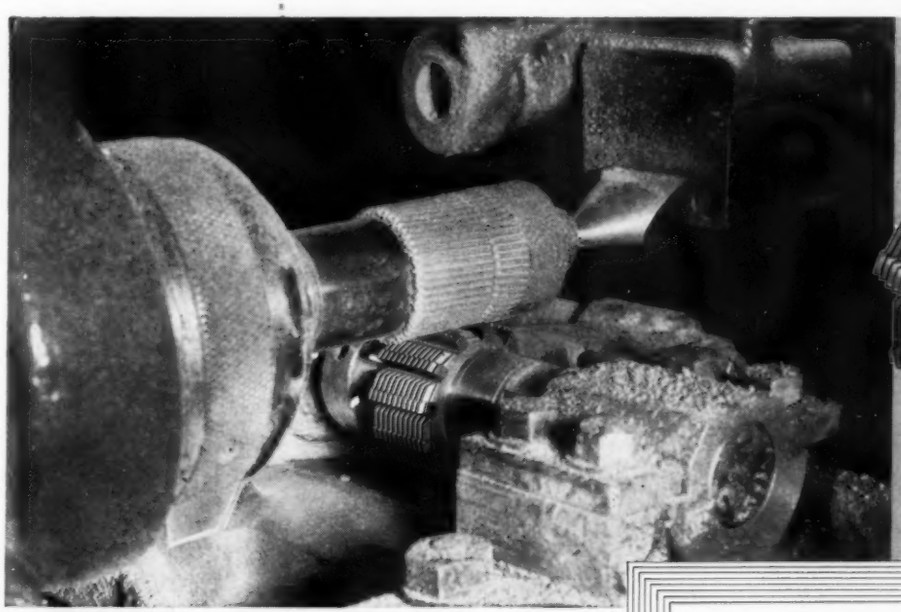
Increased production between sharpenings makes tool cost proportionately lower per piece. On highly abrasive materials which dull high speed steel tools quickly, a major improvement in wear resistance and accuracy can be obtained with carbide tipped tools.

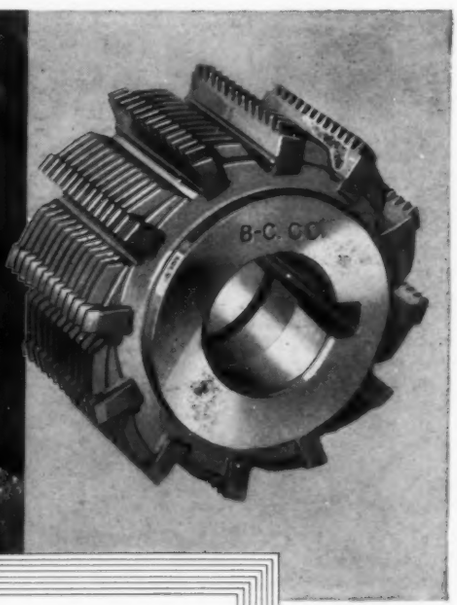
Since 1938 Barber-Colman Hob Engineers have been making Carbide Tipped Hobs for a variety of production, as well as experimental jobs. This experience has shown them that Carbide Tipped hobs, from 4 to 120 diametral pitch, are unusually successful for hobbing laminated phenolic plastics, fiber, molded asbestos, and some non-ferrous metals such as aluminum. Almost unbelievable tool life has resulted, and the gears produced are of better quality because wear on hob teeth is negligible while cutting one arbor-load.

Results so far in hobbing steel and cast iron gears have not been sufficiently conclusive to recommend use of carbide hobs. However, Barber-Colman Hob Engineers will gladly supply recommendations concerning feeds, speeds, clearances and grades of carbide for cutting non-metallic gears. Ask them to demonstrate how Carbide-Tipped Hobs quickly pay for themselves in increased production and tool life.

Barber-Colman Company

GENERAL OFFICES AND PLANT 112 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.





MODERN MACHINES DEMAND *Modern* CUTTING TOOLS — BARBER COLMAN

JOB FACTS

Operation — Climb Hob Lead Screw Gears, 36 Pitch, 53 Teeth, 2 per load.

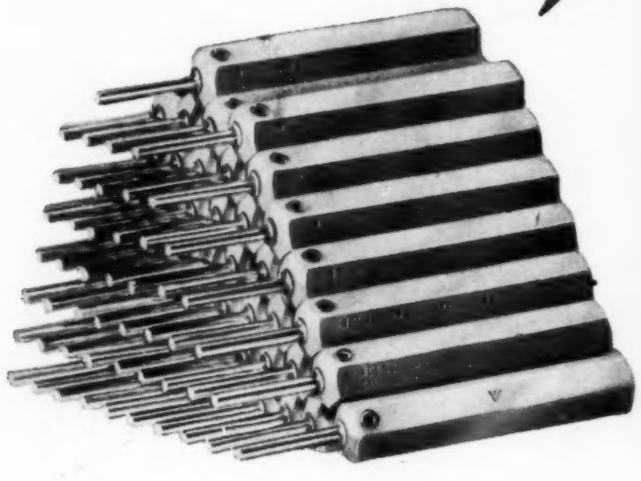
Material — Insuroc

Hob — Barber-Colman Carbide Tipped Hob, 1¾ x 1¾" x taper bore.

	Former HSS Hob	Carbide Hob
Feed—	.020"/rev.	.040"/rev.
Speed—	309 RPM	533 RPM
Floor-to-Floor—	21 min.	6.5 min.
Hob Life—	7500 total	60,000 total

Van Keuren

CARBOLOY
Wire Type
PLUG GAGES
are the right answer



1 VK CARBOLOY=50 TOOLSTEEL GAGES

After considerable experimentation with various wear resistant materials, we have chosen Carboloy as being the most practical, durable and economical. Carboloy does not flake or chip easily and is quite suitable for wire type plug gages as small as .020" in diameter.

Wire Type Plug Gages were originated by the Van Keuren Co. in 1925 and are now recognized as the most economical gages for measuring small holes. The original wire type plug gages were made of tool steel—High Speed steel doubled gage life. VK Chromium Plate gave 5 times the life, and VK Carboloy 50 times the life of tool steel gaging units. All of these materials are still in use and have their particular applications.

VK Carboloy gaging units are made in sizes from .020" to .500" diameter. They are made only in the wire type design because this is by far the most economical plug gage. In cases where it is desired to use VK Carboloy wire type Go units with existing No Go taper insert units, special handles can be furnished for this purpose.

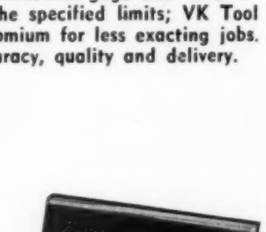
Van Keuren Wire Type Plug Gages assure longer lasting precision and lower gage cost, because the entire 2" length of gage can be used. When the end of the wire becomes worn, it is ground off. The wire type unit is securely held in the unit by a split bushing and a headless set screw.

VK Carboloy Wire Type Plug Gages are made to Class B accuracy, plus .00005" minus, .00000" on the Go unit and plus or minus .000025" on the No Go unit. Closer or wider tolerances can be supplied if desired.

On your next order Specify VK Wire Type Plug Gages: VK Carboloy for long runs because of the enormous saving in gage cost; VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that the parts will be within the specified limits; VK Tool Steel—High Speed Steel—Precision Chromium for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

The New 1948 VK Catalog and Handbook No. 34, is a 208 page manual indispensable for engineers, designers, inspectors, toolmakers and machinists. It contains simplified formulas and accurate tables for measuring spur gears, helical gears, splines and worms. New and epoch making formulas and tables are presented for the first time for the exact measurement of 29, 40 and 60 single and multiple start screw threads and worms.

It includes a complete resume of American & European screw thread systems, new methods of measuring included angle of screw threads, a new method of inspecting flat ring seal surfaces with light waves, and other valuable information. Price $1.00 each postpaid.



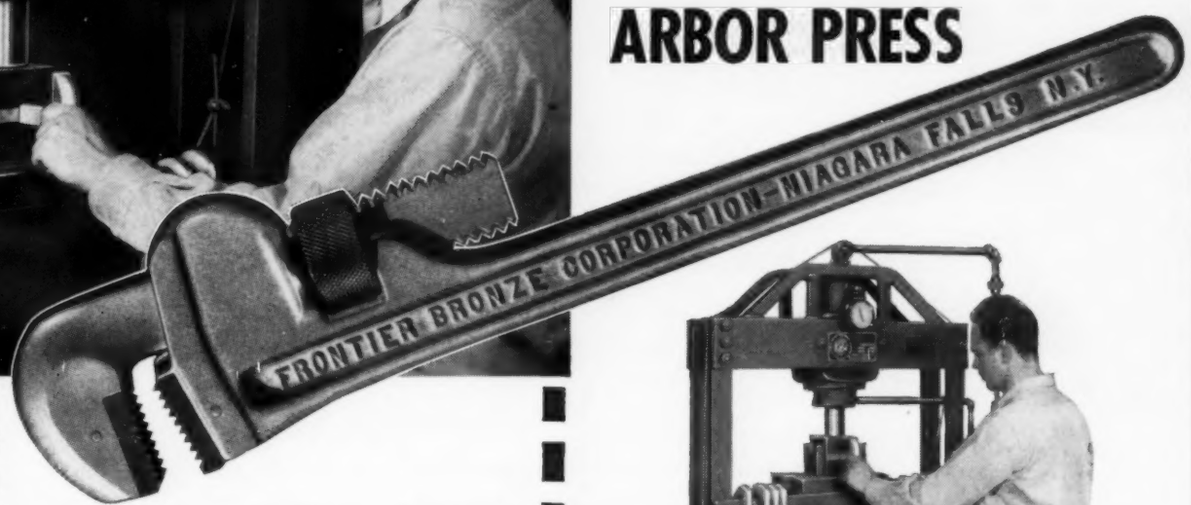
THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

"ARBOR PRESS" IN NAME ONLY!

FRONTIER BRONZE CORPORATION SPEEDS MANUFACTURE OF NEW ALUMINUM PIPE WRENCH WITH KRW MOTOR-DRIVEN ARBOR PRESS



SEE HOW A LITTLE INGENUITY SAVES A LOT OF MONEY! A special coining die used in this standard KRW 50-ton motor-driven arbor press removes burrs which result from normal manufacturing procedure. A simple operation which eliminates the need of costly grinding and assures a free-running, tight fitting, adjusting nut. *This new wrench weighs 60% less than conventional types yet withstands the same tests.*

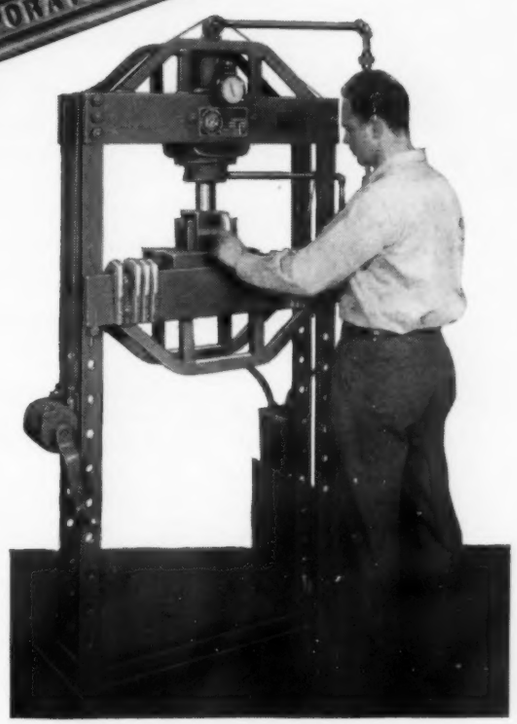
THE CONVENTIONAL ARBOR PRESS has come a long way in the past few years. From such every day tasks as straightening and bending, it has grown into a full size production tool. Today — because of their low initial and operating cost — you'll find KRW Arbor Presses doing hundreds of manufacturing operations in all sorts of plants. A little ingenuity, combined with simple, inexpensive dies can save you money by releasing heavier, more expensive equipment for larger work.

KRW Hydraulic Arbor Presses are available in varying sizes and tonnages, either hand-operated, air-operated or motor-driven. Tell us your needs ... we are fully equipped to advise and engineer presses to do your particular job. Deliveries on standard presses within 10 days.

NEW KRW 100-Ton Blanking, Forming, Stamping Press

Batteries of these New KRW Presses are now in use in many manufacturing plants doing all manner of work hitherto handled on presses whose installation costs are higher than the total cost of these revolutionary KRW Presses. Write for literature.

NAME YOUR NEEDS! MAIL COUPON TODAY!



VERSATILE · ADAPTABLE · LOW COST!

● KRW Arbor Presses can be furnished for either vertical or horizontal ram travel. Distance between uprights can vary from 1 foot to 7 or better, daylight from inches to 6 feet and more. Even these specifications can be increased with minor changes and little cost. Investigate, use the coupon.

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Please send me complete information on KRW Arbor Presses
100-ton Hydraulic Presses ☐

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Many of our customers don't bother to inspect 'em

Put new thread gages to work without checking them? Some experienced gaging men might protest at the very thought.

Yet that's what's happening in hundreds of plants that regularly get their gages from Pratt & Whitney. They *know* from experience these gages will be right — this whole line of standard and special thread gages. *Right* not only because they're carefully checked by Pratt & Whitney before shipment, but right *also* because they're precision lapped to a degree of mechanical perfection impossible to achieve without Pratt & Whitney special lapping equipment.

It cost Pratt & Whitney years of patient experimenting to create the special lapping machinery. Anybody can see for himself the benefits it brings.

Use P&W precision lapped thread gages. They'll do the best possible job . . . give extra long wear life that results in the lowest cost per hole gaged. You'll see the evidence of high quality when you put them to work.

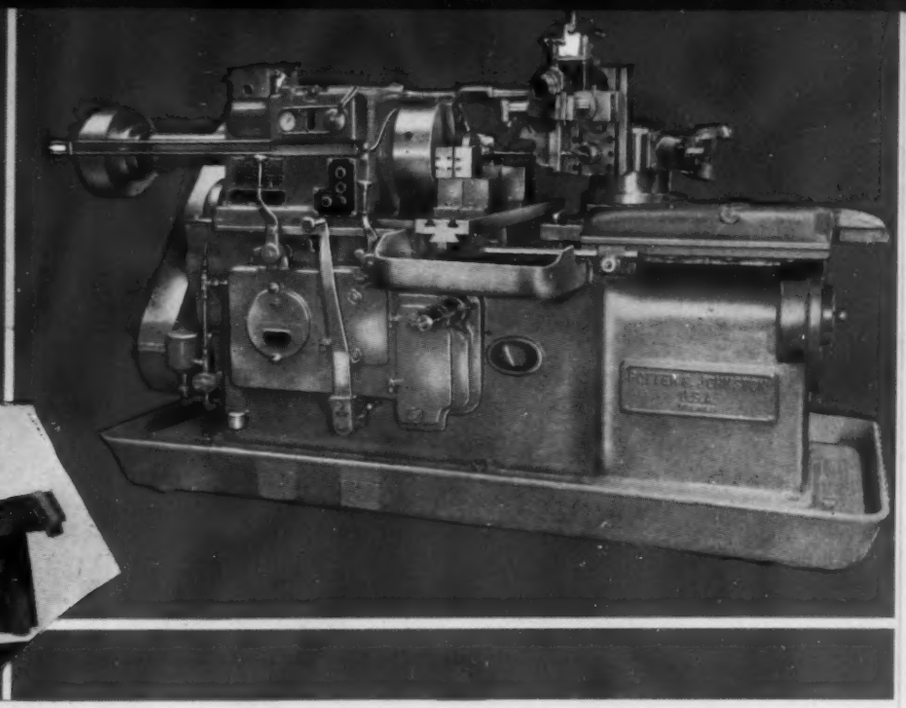
PRATT & WHITNEY
***Division* Niles-Bement-Pond Company**
West Hartford 1, Conn.

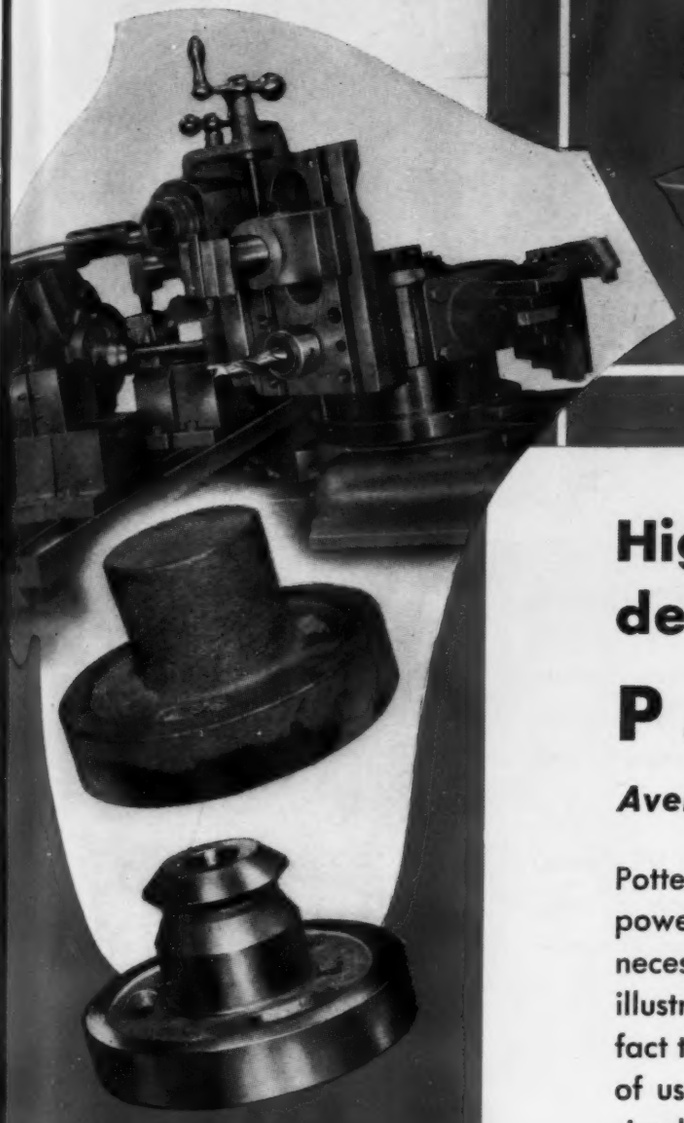
NOW ON THE PRESS — a new P&W Thread Gage Bulletin. Write for your copy.

Cross-section of P&W Dualock Thread Ring Gage shows an *extra* feature that helps gaging accuracy: note the relief at the major diameter. This means that regardless of thread contour, there's no interference at crest or root. This is a standard feature of P&W Go and Not Go Working Ring Gages.

"THERE IS NO BETTER-PAYING INVESTMENT THAN THE RIGHT TOOLS FOR THE JOB"

4DE





DETAILS OF JOB

Part: Miter and Spur Gear

Material: Cast Iron

Method and Operation:

Presenting open end to spindle, grip under rim with 3 chuck jaws.

Machine as follows:

1st. T.F.: Rough turn O.D. of hub; drill hole part way; broadface end of hub; form bevel at end of hub.

2nd. T.F.: Drill hole through; rough turn O.D.; rough straddle face rim; form groove on hub.

3rd. T.F.: Finish bore hole; finish turn O.D. of hub; finish turn O.D.; finish straddle face rim; finish form bevel at end of hub; chamfer hole.

4th T.F. Ream 1.000" dia. hole.

5th. T.F.: Blank

High production speed is demonstrated on this

P & J 4 DE AUTOMATIC

Average Floor-to-Floor Time: 3.68 Minutes

Potter & Johnston Automatic Turret lathes combine the power for making roughing cuts with the accuracy necessary for precision finishing. The job shown here illustrates this important feature of P&J machines. The fact that flexibility in tooling is always at the disposal of users of P&J machines, makes it a comparatively simple matter to tool up for maximum productivity at minimum cost, regardless of the subject involved. The net result in this case is 13.7 pieces rough and finish machined per hour, at one setting of the work. *One operator can readily handle several machines.*

Your problem naturally is different but if it involves machining of duplicate parts that can be chucked, call on P&J Methods Engineers for assistance.

Pioneer Manufacturer of Automatic Turret Lathes

POTTER & JOHNSTON COMPANY

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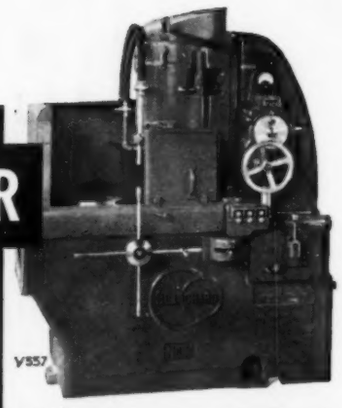
#11 BLANCHARD SURFACE GRINDER

IN YOUR TOOL ROOM....

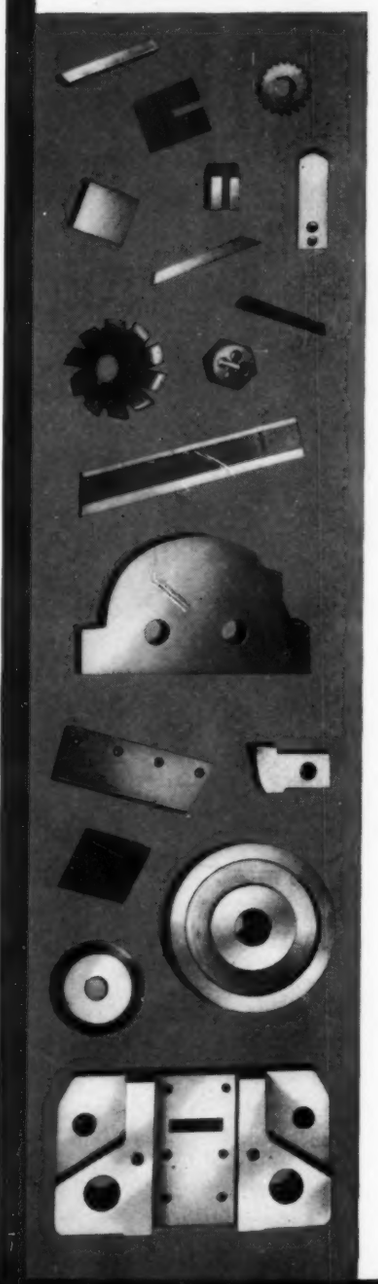


1 SAVES TIME, as compared to such operations as shaping and milling. All special holding devices or fixtures are eliminated. The *rough* cast, forged, rolled or torch-cut surfaces can be quickly Blanchard-Ground to required size, finish, and flatness.

2 INSURES ACCURACY OF SUBSEQUENT OPERATIONS: An accurate start is important on costly tool and die jobs. There's no better and surer way to make controlling surfaces accurately square and parallel than to "Put it on the Blanchard." Ask your most experienced toolmakers.

3 SIMPLIFIES ACCURATE LAYOUT: Blanchard Grinding easily and quickly produces a true, flat-all-over surface that is ideal for accurate layout work.

4 INCREASES TOOL EFFICIENCY: Saves time—Insures accuracy—Simplifies accurate layout and thereby adds to effectiveness of your top-hand tool and die makers.



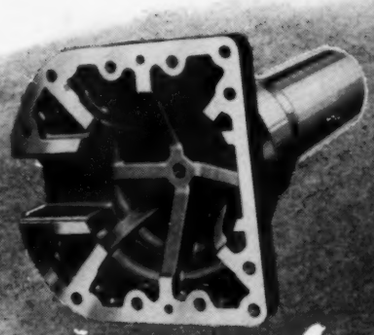
YOU'LL FIND IT PROFITABLE TO TELL YOUR MEN TO "PUT IT ON A BLANCHARD" WHENEVER YOU WANT FLAT SURFACES

An 18-page illustrated catalog on the No. 11 Blanchard Surface Grinder is yours for the asking.

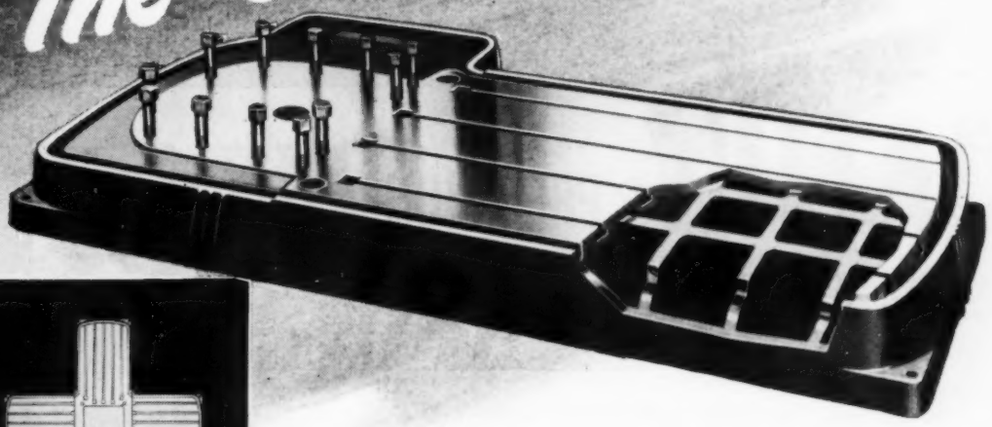
BLANCHARD

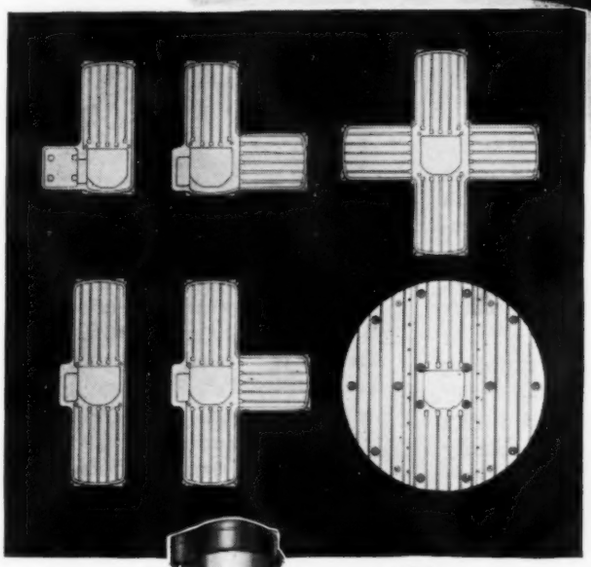
The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



From the Ground Up





In the base starts the story of accuracy—deflections here are magnified in the column and the arm, and the whole machine loses the power to do the job correctly. Today new design bases again increase the accuracy of Bickford performance.

Many years of development are behind the base of a Cincinnati Bickford Super Service Radial Drill, and the many different types of base available all have the same basic deflection-free structure.

The outstanding accuracy and performance of Cincinnati Bickford Super Service Radial Drills start from the ground up. Write for Circular R-29 for a complete description of the production features of the Cincinnati Bickford Super Service.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

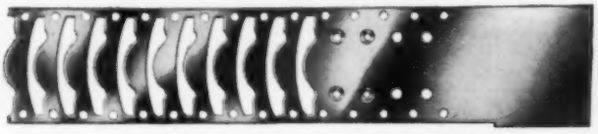
130 parts per minute from .062 stock

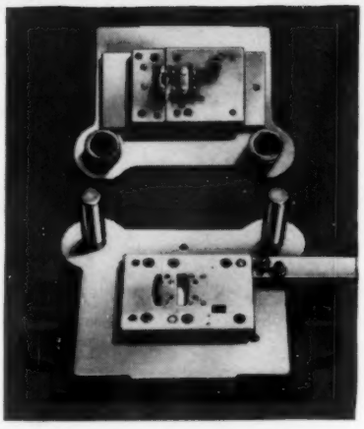
tolerance held within .002"

. . . using

DANLY PRECISION DIE SET

Six-stage progressive die produces 65,000 steel stampings per grind





In the stamping operation shown here, .062 cold rolled steel parts for electric shavers are pierced, swedged, sized, and blanked in an intricate six-stage progressive die. A Danly Precision Die Set, consisting of a semi-steel punch holder and all-steel die shoe, is used to take full advantage of the die maker's precision.

The six-stage die produces these parts at a rate of 130 per minute. Over-all tolerances are held within .002", and *an average of* 65,000 *parts are obtained between grinds.*

As a result of the close operating precision that is maintained, tumbling is the only secondary operation that is required to finish the piece.

Built to precision tolerances (guide posts and bushings ground to limits of two ten-thousandths of an inch) the operating accuracy of Danly *Precision* Die Sets insures close tolerances and long tool life.

Danly has a wide range of standard stock sizes available that can be quickly assembled and delivered to help you save time and money.

Danly engineering service—For helpful information on die sets of any size, standard or special, for any type of press operation, consult our engineering department. No obligation.

sequence of operation

Following is the sequence of operations performed as the C. R. Steel Strip is fed through the six-stage progressive die:

1st Step: Notch edge for feed stop.
2nd Step: Pierce pilot holes.
3rd Step: Pilot in outer holes. Pierce two holes.
4th Step: Swedge two holes.
5th Step: Pierce holes to size.
6th Step: Blank.

DANLY NATION-WIDE ★ ASSEMBLY SERVICE

Danly offices in 10 key cities give immediate attention to your orders. Assembly plants (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to your specifications.

★ **Chicago 50,** 2100 S. 52nd Ave.
★ **Cleveland 14,** 1550 E. 33rd St.
★ **Dayton 2,** 990 E. Monument Ave.
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★ **Grand Rapids,** 113 Michigan Ave., N. W.
★ **Long Island City 1,** 47-28 37th St.
★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
● **Milwaukee 2,** 111 E. Wisconsin Ave.
● **Philadelphia 44,** 18 W. Chelten Ave.
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get this *free* bulletin

Illustrates how Danly's Special Machining and Welding Service can save you time and money for unusual die set applications.

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS...STANDARD AND SPECIAL | MECHANICAL PRESSES AND PRESS EQUIPMENT

SPOT NEWS OF METALWORKING

One of biggest steel users will continue to buy from its present sources rather than attempt to shift to mills near its fabricating plants, despite the steel industry's abandonment of the basing-point system. Its decision will cost it $3 to $4 a ton extra.

For first time under Taft-Hartley Act, NLRB has decided that an employer moved his business (from Akron, O., to Kenton, O.) to avoid bargaining with a union. NLRB has ordered 28 women rehired, paid back wages to the time the change was made, and moving expenses.

Steel scrap is to be returned from Germany under this plan: 1) one or more U. S. steel companies will be given the job of allocating the tonnage on their ability to put enough men in Germany to push through the operation; 2) these companies will deal directly with German scrap dealers; 3) scrap will be sold to U. S. at reasonable price by military government pressure on dealers and by offering incentive goods (cigarettes, stockings, chocolate) as part payment.

Getting enough experienced supervision is one of the production headaches of the jet program. It means the spreading out of the talent now at hand, in the case of some companies, until new men with sufficient supervisory know-how can be trained.

Tucker's new car has a "hydro-kinetic" automatic drive designed by Warren Rice. It is a torque multiplying device which gives an infinite variation of speed from start to top direct drive. It has two hydraulic couplings, but no hydraulic torque convertor to accomplish the variation. It is unlike anything used for this purpose to date.

Strike of Detroit tool makers in UAW shops is having little or no effect on tool and die business outside that city. No work is being sent elsewhere. Shop owners offered 11 cents per hour increase, plus 3 cents more the second year. Union is demanding 20 cents.

Ships are being developed with plastic hulls up to 100 ft. long molded in one piece. In fact the hull, deck and frames are an integral unit.

Supervisors may not act for employees in seeking decertification of a union as bargaining agent, rules NLRB. Taft-Hartley excludes supervisors from employee group.

Expenditures for new plant and equipment in first quarter of 1948 were 32% ahead of the same quarter a year ago, according to latest report from Commerce Department and SEC. Scheduled spending in second and third quarters is 19% and 10% respectively more than in the corresponding quarters of 1947.

Buick's "Dynaflow" production should be close to 10,000 units a month by early fall. Reports have it that a smaller unit will be made for the Buick 50 and the same type of unit will be used by another GM division.

Some parts companies are dovetailing their vacation plant shutdowns with those of their main customers. The vacation period usually is two weeks.

Taft-Hartley Congressional "watch-dog" committee is expected to recommend that pensions and other welfare matters be excluded from "working conditions" subject to collective bargaining.

Inability of marine engineering works in England and elsewhere to handle overseas orders has compelled Australia to equip merchant ships now under construction with diesel power plants built in a government-owned workshop at Port Melbourne.

Gaging Metalworking

What has happened in steel gives the answers to metalworking's three all-important questions: 1) materials shortages, 2) effects of the shift to f.o.b. mill pricing, and 3) wages and prices.

▸ The hike in steel wages of 13c. an hr. plus the increase in coal costs have made it necessary for steel mills to raise their prices. Users thus are confronted by the equivalent of two price advances at one time—the higher delivered prices paid by most customers under the f.o.b. mill system, and the actual raising of basic prices.

▸ Late this year steel is likely to be tighter than ever. Reason: the government's program of voluntary allocations, military requirements and ECA exports. Tonnage taken for these purposes will leave private users with less steel than they had figured on.

Steel Changed at Good Time

The steel industry could not have picked a better time to make the switch to f.o.b. pricing. Steel users are taking all the tonnage they can get, with price a secondary factor. Also, the steel people have narrowed the geographical area served by individual mills so that the average freight absorption lately has been less than it used to be. The size of the freight charges to be shifted from mills to customers is much less overall than anticipated.

▸ As a result of higher labor costs and recent advances in freight rates, steel mills may be forced to increase their prices. Wage boosts in coal and steel alone add more than $2 a ton to steel costs.

Future Allocations Uncertain

Future of the voluntary allocation program is unknown. Agreements under this program expire next spring. If they are to be renewed, Congress must act during the coming special session (because negotiations leading to agreements take months). Unless Congress acts, negotiations probably will be suspended in the early fall.

▸ Mandatory steel allocations apply only to military needs—perhaps 1.5 million tons in all. The President handed the Commerce Department, not the military, the job of carrying out this program. And both Commerce and the Army hesitate to use their power. Net result: amount of steel to be allotted under mandatory allocations probably will be small.

More Controls Not Justified

No one knows yet the amount of steel necessary for the government's entire program. Industry spokesmen put it at 17 million tons; but it may be more. Recent shipments have been at a rate of 14 millions a year. An increase of 3 million tons isn't enough to justify more controls. All this means, however, that steel will continue in tight supply. But it probably won't be much tighter this fall than it was last spring.

Aluminum Use Small

Washington's latest estimates of government metal requirements should allay the fears of industry. The Navy will use the greater part of the 1.5 million tons of steel for military purposes during fiscal 1949. The Air Force will take less than half of one percent.

▸ The plane program for the Air Force and Navy will call for 4.5% of total U. S. aluminum production. Half of it will be sheet, 21% in forgings, 10% in extrusions, and 19% in all other shapes. This means that around 2700 planes will be delivered the next 12 months (1600 to the Air Force. 1100 to the Navy).

▸ However; demand for aluminum has continued to increase to a point where an authoritative source predicts that one-half billion pounds more of the light metal could be sold than the industry's capacity. However, it appears at this point that the estimated capacity of 1,250,000,000 pounds will not be produced in 1948, with only 1,150,000,000 pounds reaching the market. If there is more curtailment of electricity, even this latter mark may not be reached.

▸ The recent increase in aluminum prices has not appeared to have caused any serious reaction in the fabricating field.

Plastics Orders Fluctuate

The plastics industry, which has been doing well this year, is in need of more business. Injection molded parts makers at the moment are reported doing better than the makers of compression molded parts. Some plastics manufacturers say that bookings have fluctuated sharply lately; one week orders are brisk, and the next week they are off.

▸ Plastics people have benefited from the aluminum shortage. Refrigerator companies, for one, have turned to plastics as a substitute for aluminum for certain parts.

Machine Tool Orders Rise

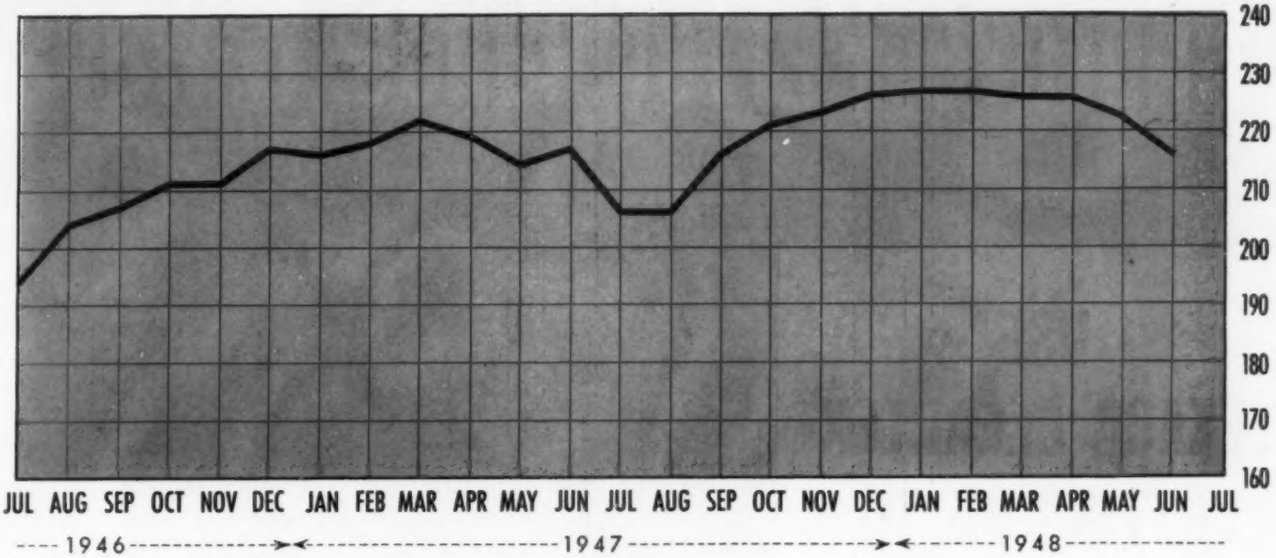
June was one of the best months of the year in new machine tool orders, according to preliminary figures. It was much better than May. Some builders attribute the improvement to the desire of buyers to clean up jobs before the summer vacation season got going. In addition, price increases drove in some business.

▸ Despite the hump in fresh orders, the industry's backlog took a beating. Shipments were maintained at a high rate. But beyond that, cancellations were heavy. A considerable portion came from foreign sources. Present backlogs are about big enough to keep the industry busy for four

Index Off 6 Points

Metalworking production in June dropped six points to 216, from 222 in May, according to American Machinist Index. Decline in automobile output and in the building of other transportation equipment was mainly responsible for the sharp decrease. Industrial machinery and electrical machinery dipped only slightly. It is believed that final figures for July will show a rise from the June level.

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX	COMPONENTS				
	MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANSPORTATION EQUIP.	OTHER METALWORKING
JUNE 1948..... 216	250	227	217	282	148
MAY 1948..... 222	251	229	225	289	144
JUNE 1947..... 217	229	232	218	305	147

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1 Index figures are a percentage of 1939, which equals 100.

months, if business were evenly distributed. But one worry is the fact that conditions throughout the industry are extremely spotty. Some builders are doing better than last year, others worse.

ECA Holds Off Purchases

No business has been forthcoming from ECA in machine tools. Bookings from that source are still just a hope. The truth is that European buyers have placed orders with U. S. machine tool dealers in France totaling $90 million. But the French government has refused to allow the dollars for these purchases because it believes that it can get the desired machines eventually through ECA on long terms of credit.

▸ A major cause of hold-up of ECA production equipment orders also is the inability of western European governments to decide how many machines and how much bread they want. ECA's Washington headquarters are urging their own Paris officials to loosen the log jam in production-equipment orders.

Machine Tool Prices Increased

Some machine tool builders are reported to have raised prices, in certain cases up to 15%, effective July 1. Blame for the advances is put on the higher costs of electrical components going into the machines and on increased costs of labor and materials.

▸ Defense business for machine tool companies still is merely a dribble. Large tooling jobs are pending, but very few of them have been placed as yet. Despite the famine in export and defense orders, many builders have had a brisk volume of business from a wide variety of domestic customers.

Tool and Die Shops Doing Well

Contract tool and die shops did a better business in May than in any other month this year. The volume almost reached the total in the same month of 1947. Actual sales invoices in the first five months of this year were 94% of those in the comparable period a year ago.

▸ New orders received have fallen off, however, and now are at the lowest point this year. Backlogs have remained steady. They have not varied more than 5% during the past year. At the May rate, they represent slightly less than two months' operations.

Cleveland, Chicago Shops Busy

Tool and die business has picked up in New England, after having lagged badly earlier in the year. Cleveland and Chicago are the best spots in the country just now. Shops in Cleveland are busy on work for special-purpose machines. A slowdown is noted in Dayton, Ohio, shops.

▸ Employment continues to decline. In many plants the work-week has been shortened to five days at straight time only. The strike in Detroit shops has tied up operations there, but customers have shown little inclination to take jobs outside the area because of the shutdowns.

Foundries Feel Shortages

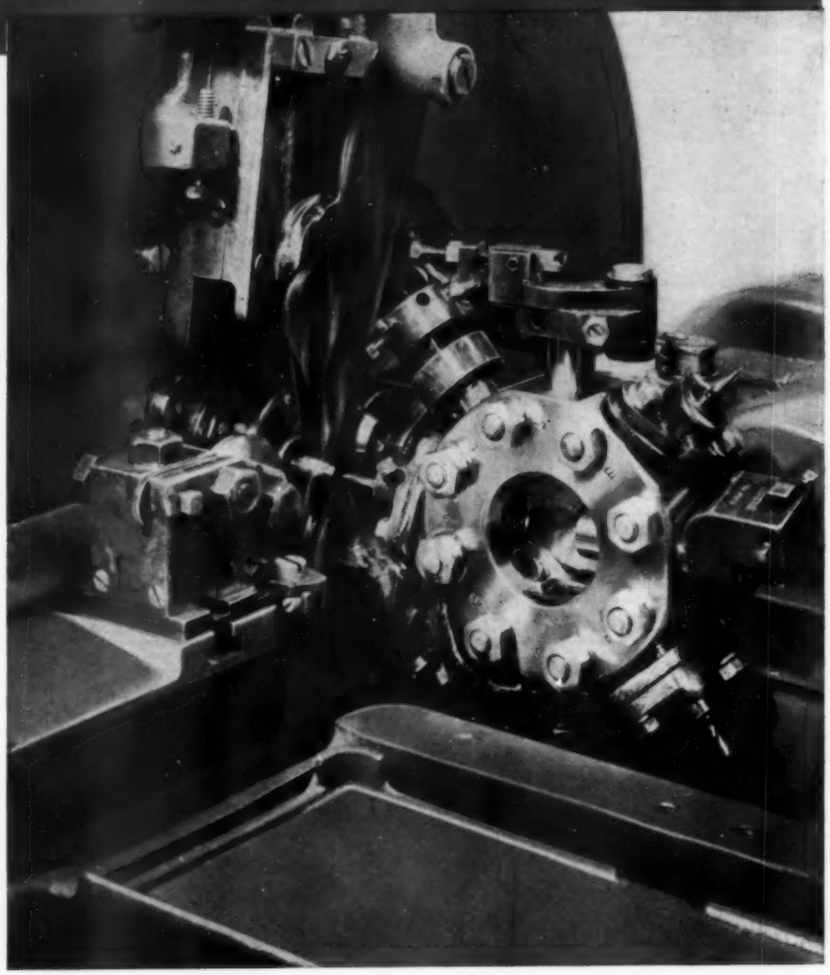
Gray iron foundries are operating at about 80% of maximum commercial demand. The rate would be stepped up if enough raw materials were available. The industry's backlog, which was chewed up considerably in the final quarter of 1947 and the first quarter of this year, is expanding.

Job shop foundries have almost all the business that they can handle. They are concentrating on getting a diversity of customers and ones with steady demands.

Improve Performance 6 ways

USE TEXACO CLEARTEX CUTTING OIL TO ASSURE

1. increased production
2. lower costs
3. longer tool life
4. improved finish
5. fewer rejects
6. less machine down-time



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

We Need More "Multipliers"

"IT IS the 'multipliers' that will count the most in bringing about industrial recovery in western Europe."

The speaker was a high official of the Economic Cooperation Administration. He continued, "Europe obviously needs food and other relief items, but such aid is merely a temporary expedient.

"Relief will not insure economic recovery. It is only the first step in that direction.

"Economic recovery can come only when Europe's industries are provided with the productive equipment which will enable them to turn out more goods with the same number of workers.

"What Europe needs and must have is 'multipliers.' Its manufacturers must be supplied with the machines which workers can operate to multiply their production."

The ECA official put his finger on Europe's most vital requirement for industrial recovery: multipliers. That means more new machine tools, more presses, more forging equipment, more welding units, more materials-handling equipment.

Greater productivity is one of western Europe's prime concerns. If it can raise its output per manhour and stand on its own feet again economically, you and I as taxpayers will benefit. Greater productivity can be attained mainly by the use of "multipliers."

But why limit the need for multipliers to western Europe? Are we so good and have we reached such a high degree of productivity that we can afford to be indifferent or complacent?

The answer is: What applies to western Europe should apply to us as well. We have grown great as an industrial nation because we early saw what multipliers could do. We put them to work.

All along we have prided ourselves on our mass production of goods. Mass production made it possible to sell those goods within the financial means of millions of our people. And what is mass production? It is no more than using multipliers to the nth degree.

Just where are we today? A third round of wage increases is upon us. It brings with it the chilling effect of higher costs—for labor, for raw materials, for components.

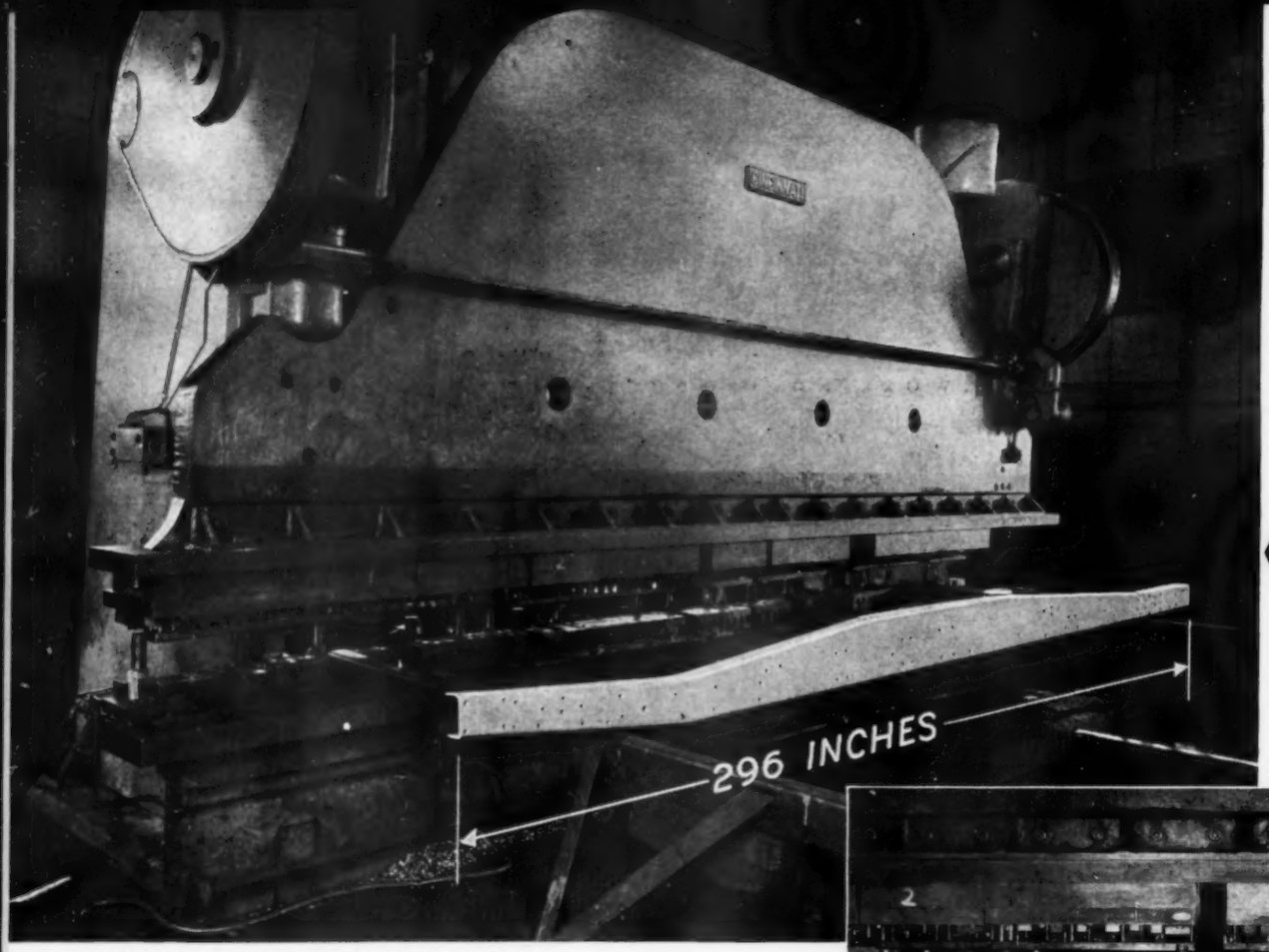
The only hope of cancelling the evil results is by squeezing out more production per manhour. That can best be done by utilizing multipliers to do the job.

The multipliers to which we refer are new machines which produce one-third to one-half more than their predecessors; materials-handling units which cut drastically the expense of hauling work around the plant; presses which operate far faster and with greater precision than those now installed.

Never have America's metalworking industries been so dependent upon multipliers to reduce costs and maintain profits. Metalworking managements should keep that fundamental fact very much in mind and be guided accordingly.

Burnham Finney

EDITOR



Material: ⅛" mild s
Maximum numbe
holes: 104. Maxi
diameter of hole: 1

A close-up of the p
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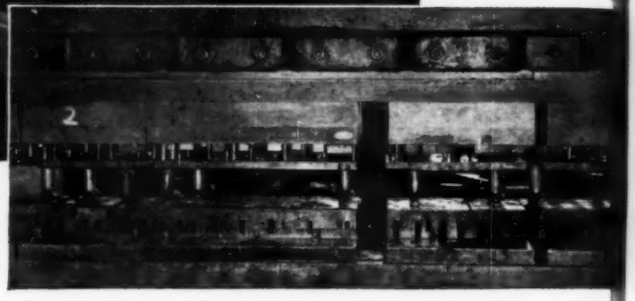

PHOTO—COURTESY YOUNGSTOWN STEEL CAR CORP.

PUNCHING

104 HOLES EVERY 10 SECONDS

The multiple punching of these holes must be very rapid; however, another important requirement is the maintenance of accurate location, and the spacing of one hole from another.

The assembly which follows is smooth and certain—no costly misfits on these 24-foot trailer frames.

On this Cincinnati Press Brake the spacing, the number of holes or the size of the holes may be changed quickly and economically, as required . . . or the brake may be used for many other operations—all accomplished with minimum time loss and at low cost.

Write for Catalog B-2. It illustrates many applications for the press brake and press work performed on Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

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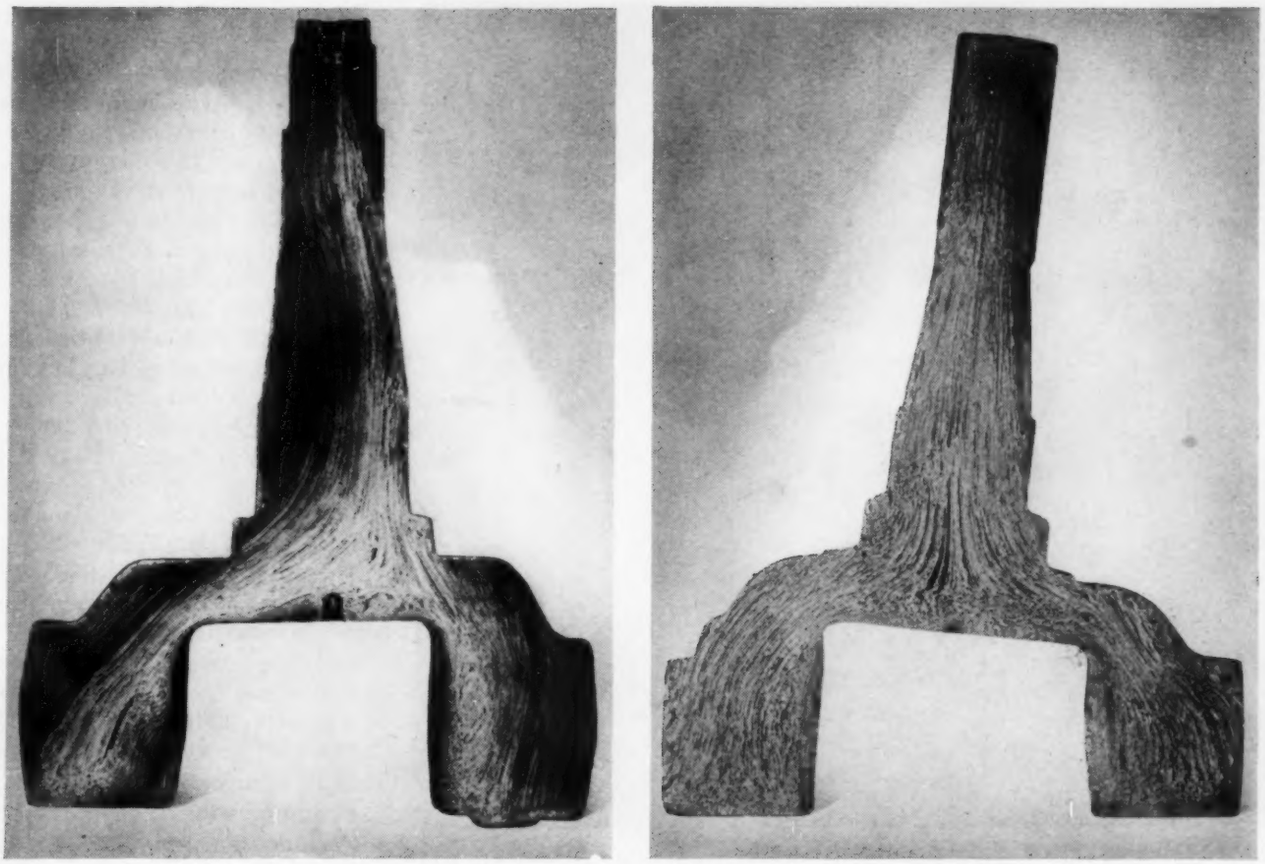


Etched sections of steering knuckles made from bar stock (left) and from a rolled blank show the improved arrangement of grain flow with the rolled blank

How Packard Whips TOUGH FORGING JOBS

Forging critical automotive parts brings up some unusual problems. Here's how company engineers solved typical ones

BY GEORGE F. DASCHKE
Division Manager, Forge Shop
and
HAROLD LAWSON
Superintendent of Forge Shop
PACKARD MOTOR CAR CO.

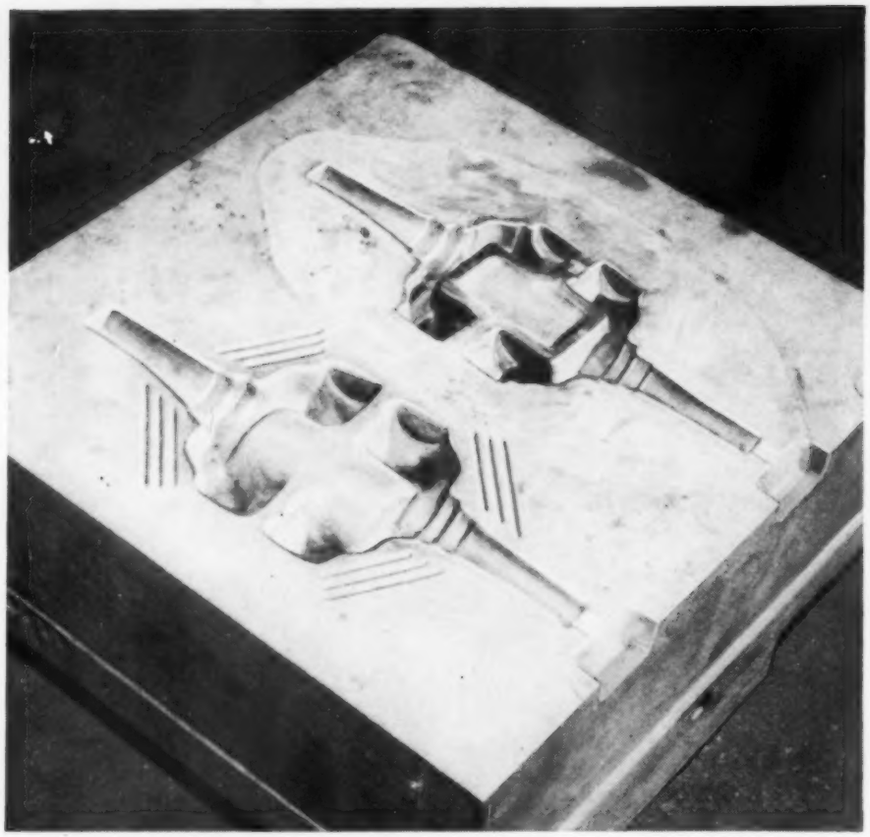
EVERY die-forging job has problems that are unique, as every forger knows, but even so, most of the work can be handled by more or less convéntional means with the necessary skill and experience.

However, some forgings can't be produced by conventional means, or can be done better in some other way. Sometimes a job is a succession of problems from beginning to end; in other cases, only one step poses a special problem.

Here are some of these problems that we have encountered recently at Packard, along with our solutions. Each is unusual in some way and may give others ideas for handling similar problems.

Among the most important parts in an automobile are the steering knuckles. These forgings support the front wheels as well as permitting steering. A defect in a steering knuckle can be disastrous. For this reason, much care has been lavished on developing forging methods that will produce the maximum strength and will eliminate, as far as possible, the chance of any forging defect that might result in failure.

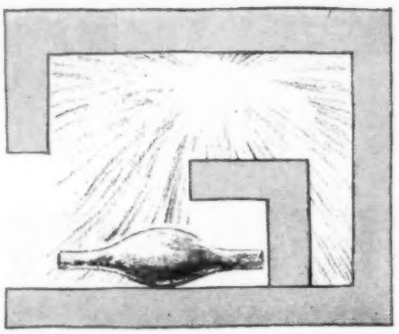
The shape of the steering knuckle complicates the problem. It is of relatively small cross-section through most of its length, but of large cross-section at the pin end. Our solution now is to forge the



Rolled blanks with large center section are forged in this die to produce two steering knuckles

knuckles two at a time from a rolled blank. This blank is rolled to give a large section at the center with smaller section at the ends to form the spindles of the two steering knuckles. This has resulted in a much better distribution of the grain flow lines and a stronger product.

However, the rolled blank introduced heating problems. To bring the center section to forging temperature caused overheating and burning of the smaller end sections. The most practical way to overcome this would be a pusher-type controlled-heat furnace. However, this was not immediately available and the forgings were immediately needed, so a means had to be devised to prevent overheating of the ends. Placing the blanks so that one end was near the door where heating is slower took care of half of the problem but placed the other end in the hottest part of the furnace. A baffle was installed in the furnace to protect the inner end of the blanks from direct heat of the burners. This has proved very successful.



Baffle in the furnace protects one end of the rolled blank from burning. The other end is near the door, which is the coolest part of the furnace

To make sure that heating practice does not slip and permit a group of forgings to be burned, a spot check is made in the cleaning room at the forge shop. To do this, about 3% of the forgings are etched and inspected visually.

After the forgings are heat-treated and have had the scale removed by Tumblast, the pieces to be spot-checked are hollow milled on the area most likely to be burnt (the spindle end). This hollow mill removes about 0.020 in.

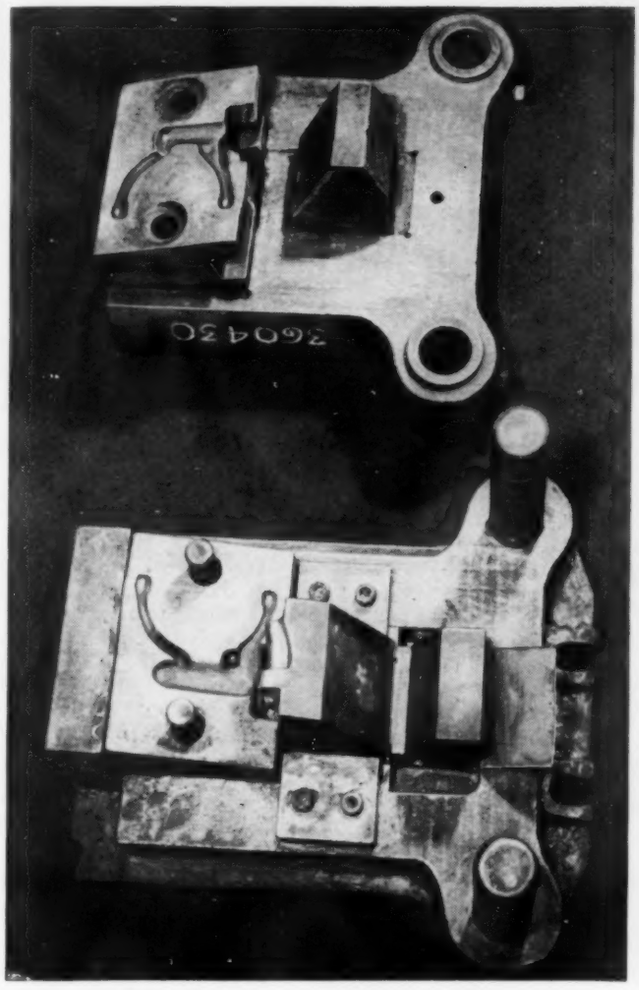
Parts are preheated in hot water, then etched for 10 min. at 180 F. in 20% (by volume) non-inhibited sulphuric acid. Monel baskets hold the work for this etch. Copper would be picked up by the work, filling the cracks and preventing accurate inspection.

After the etch, parts are rinsed in cold water and then neutralized in a dilute alkali solution such as Oakite or trisodium phosphate. This is followed by a hot-water rinse and blowing to dry.

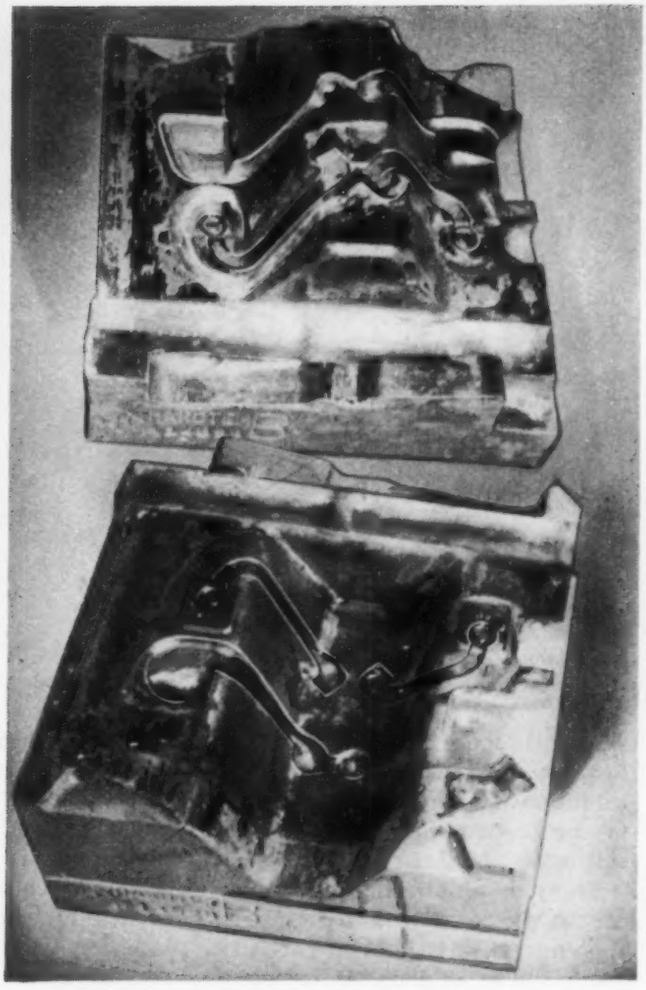
Machined surfaces are then inspected with a 7-power illuminating glass. A burnt area will show up as a mesh of fine cracks in a rough, chicken-wire pattern. This method is necessary because magnetic-particle testing will not reveal these cracks.

It has been possible to work this inspection process into the normal operations of the forge shop by making the spot check once a week, at the time the pickling bath is cleaned out. The acid etching

Etched steering-knuckle forging is inspected with a 7-power illuminated glass to make sure small ends of rolled blanks are not being overheated



Bending die has a sliding section on the lower die which is actuated by the wedge on the upper die



Slipping dies are prevented by forging two transmission levers end to end so stresses of offsetting are balanced. Bending section (rear of lower die and front of upper die) starts the bends at outer ends. Inner bends are made and outer bends completed in the blocking impression

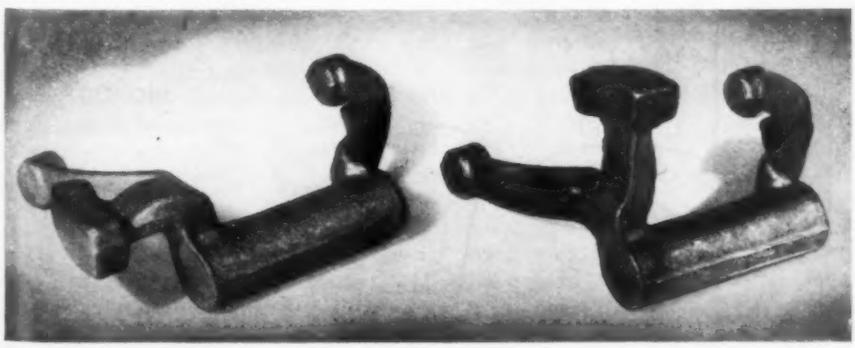
solution is placed in the tank and after the week's samples have been etched, the remaining acid is added to make up the new pickling solution.

Shifting the Shoe

On the transmission-shift lever there is a shoe at right angles to the fork. This would be easy to cast, but cannot be forged in this shape. The part can be forged, however, with the shoe bent over on its side so that it is parallel to the fork.

In this position the lever is forged and trimmed by conventional methods. After trimming and cleaning, the shoe is inserted in an induction heater, then bent to the required position.

An ordinary bending die would not bend the shoe up far enough, so that a compound-action in the bending die is required. This is accomplished by a wedge on the upper die which operates a sliding arm on the lower die. This sliding arm completes the bend to the vertical position while the shift lever is clamped in place on a pad in the die.

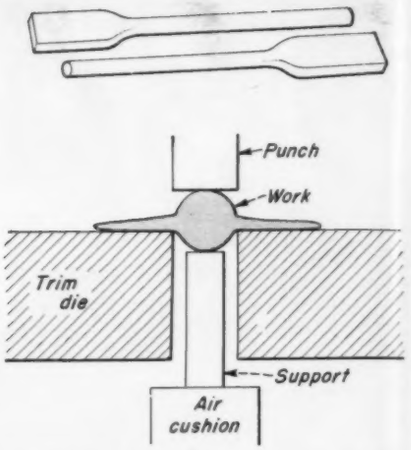


Transmission shift lever as it is forged (left) and after the shoe has been bent upright in the compound bending die

Bent While Blocking

An offset parting line is always a problem in forging. We have a transmission lever that has two bends in it. A die was readily designed to forge this, but the offset parting line caused the dies to slip and prevented accurate forging. Bending after forging was tried

Four steps in the forging of two transmission levers: (from left) fullered stock, bent stock, blocked, finished



Cushioned trimming stopped poor trims on the clutch shifter lever. Levers are forged with two nested as at top, but trimmed individually. The work support mounted on an air cushion prevents roll of the work under the punch

with little success. A die lock could have been added, but a better solution was to forge two parts end to end so that the stresses of offsetting balanced each other.

The rod is first rolled in a fuller on the dies to gather material for the ends, then is bent to partially shape the outer ends. However, it is not possible to bend the stock far enough in this operation.

The stock is then laid across the blocking impression and a first light blow is made with the hammer to bend the center section down into position. At the same time the original bends started in the bender are completed. This is accomplished by hollowing out the lower blocking impression to form an inclined surface leading down into the impression. As the upper die descends it pushes the outer ends of the stock down these inclines into the hollows to provide the required additional bend.

Cushioned Trimming

A trimming problem developed in the clutch shifter levers. These are forged with two parts nesting together. The lever has a long round section with a short flat section at one end. The two parts are trimmed from the flash separately.

If the forgings are slightly out-of-match, the round section tends to cut on only one side and then twist or roll down under the punch into the die cavity.

This was solved by a support under the work in the trim die. This support is mounted on an air cushion which provides enough resistance to hold the work up in place for trimming and provides enough "give" so that the punch can push the piece past the trim edges of the die.

Gear Centering

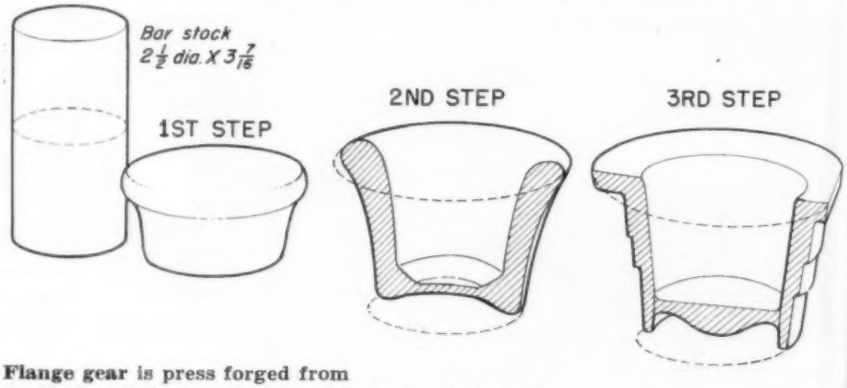
When gears are press forged there is sometimes difficulty in placing the work properly on the dies. The finishing impression generally causes no trouble because by then the shape is well defined and the blank is already blocked so that it will fit into the finishing impression in exactly the right position. In the early stages this is not the case, and the blank may be positioned off-center in the dies.

We use square billets with rounded corners for pressed gears. The heated slug is first placed on a die impression which is dished to exactly fit these corners so that it is easy to center the hot metal. This die also has a center depression which forges a button on the bottom of the blank.

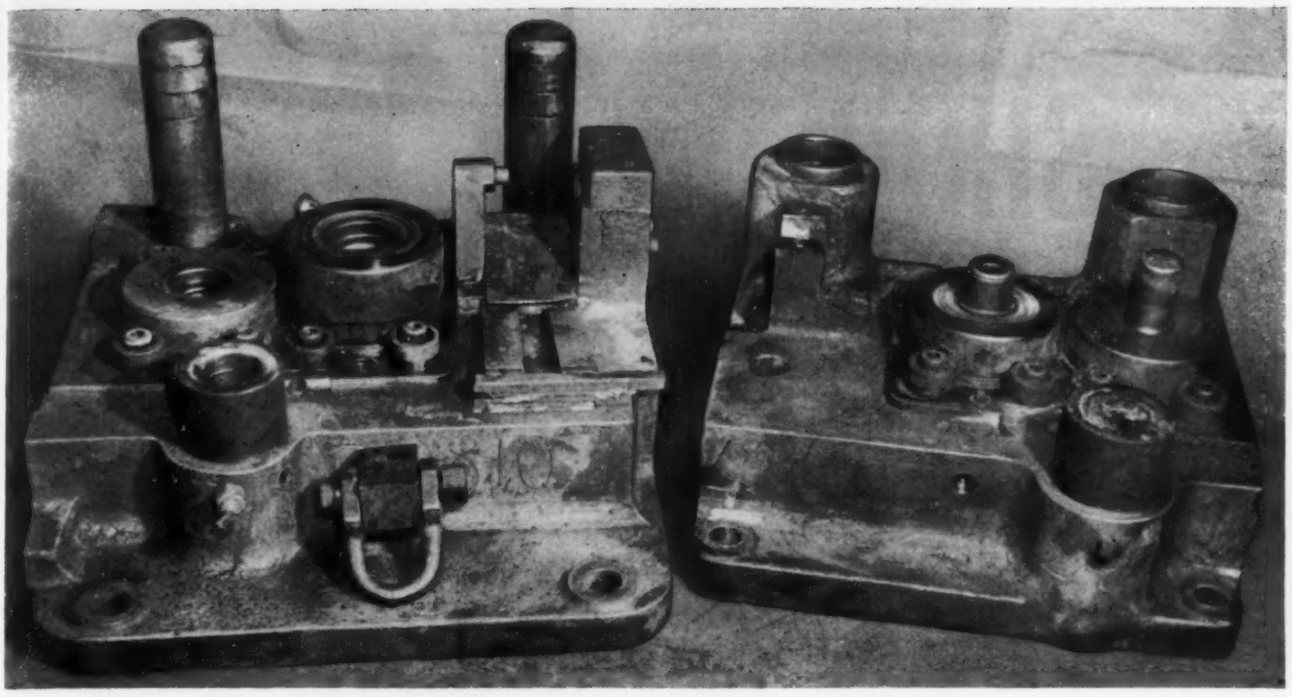
When the blank is transferred to the blocking impression, the button fits into a recess in the bottom of the blocking die. This assures centering for the blocking operation which is the crucial step in getting proper distribution of the metal.

Rear-Axle Flange

An interesting sequence of operations was developed in the production in a high-speed forging press of a rear-axle flange. This



Flange gear is press forged from double length bar stock sheared in half on the press



Press die for the rear-axle flange gear. The straight relieved punch can be seen at the right rear of the upper die (right) and the shear at the left of the same die

forging was produced with one heating and involved three operations. It is produced on a three-stage die: buster, blocker, and finisher.

The blanks were cut two to the bar and heated, then sheared in half on the press. The operation went extremely fast so that the bar could be sheared in one press stroke, one flange forged in three strokes, and then the other half of the bar could be forged before it had cooled.

Production was rapid, that is, after a set of dies had been developed that would work. As can be seen from the drawings of the part, the forging is deeply dished. After the finishing operation, only a thin web is left to be pierced out.

After the stock is sheared, one half is placed on the busting impression and struck with a flat punch to produce the shape shown in the first step. This is then placed in the blocking impression and in the second step the metal is extruded up around the punch.

This second step caused the trouble. The work would freeze to the punch. Draft angles up to 30° were tried without eliminating the sticking.

Finally, the problem was solved with a relieved straight punch. The work extruded along the punch, but because of the relieved sides, the work had to drop free of the punch end only. This it did without difficulty.

Because the extrusion was accomplished in the second step, no serious difficulty was encountered in the third step. Knockouts were provided on both punch and die for the third step. Dimensions for die shift are held within 0.025 in.

Tips FOR TOP SHOP MEN

246 Safety regulations are so important that it's essential to see that no pictures, bulletins or sketches incorporate violations. If you *look* safe and *act* safe, your men will be more conscious of the need for safety.

247 Victor Hugo tells the story of the old-time sailor who let a ship's cannon get loose, endangering the ship in rough weather. He secured the gun again, and saved all hands. For the second deed, he was decorated; for the first, he was hung from the yardarm. Rather drastic treatment, but not as drastic as yours when you bawl someone out for making an honest mistake, without showing appreciation for his initiative in trying to do better.

248 Are you sure you know your men? What hobbies have they, or what previous experience, that may help in a pinch? The astronomer-hobbyist who made his own telescope can give you pointers on grinding a lens for that new instrument; the man who once repaired radios may solve a knotty electronic-control problem.

Yes, dear

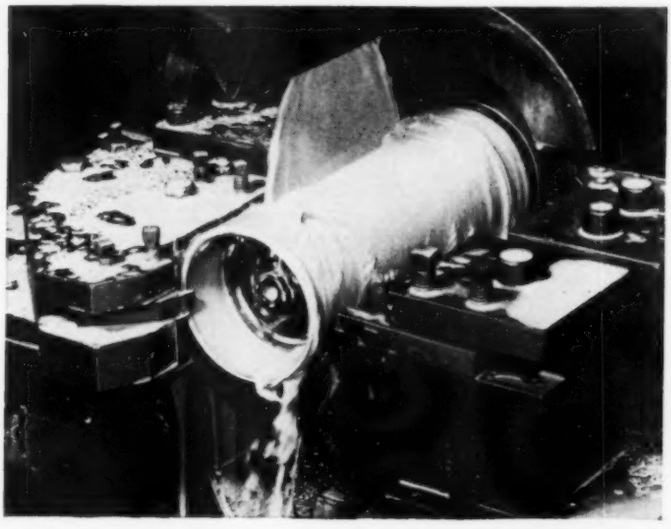
SHOP SHOTS

FROM

INTERNATIONAL HARVESTER

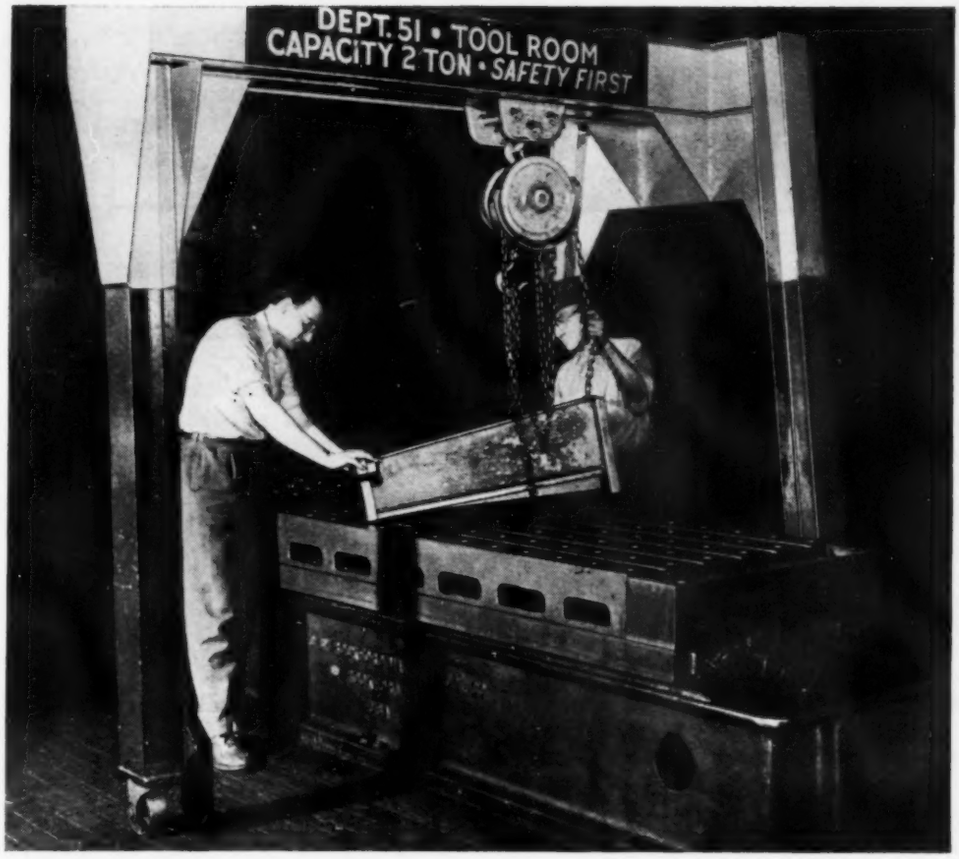
INDIANAPOLIS WORKS

Go and not-go disk gage mounted on splash guard of Gardner two-spindle grinder checks height and taper of connecting-rod faces during grinding cycle. Upper disk has 0.002-in. tolerance step in its lower face. Operator detects taper by inserting rod in chrome-plated gage at different angles

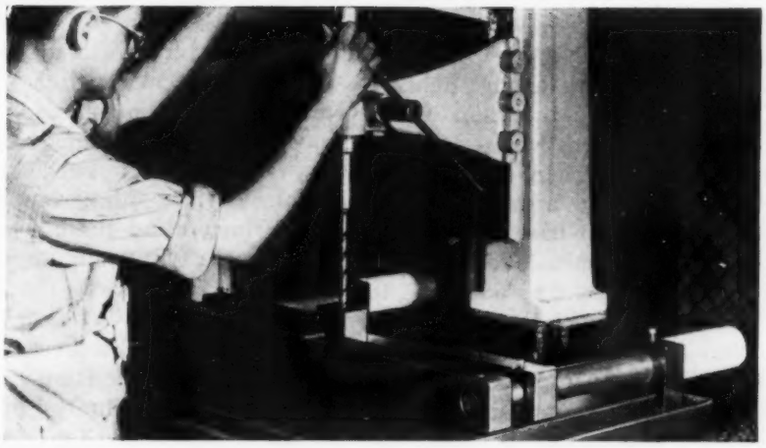


Toolblock on Gisholt front carriage has been revised to carry carbide-tipped chamfering bit. The 1/16-in., 45° chamfer on the fine-grain, cast-iron cylinder sleeve is cut when cam bar drops tools away from work after turning cycle. Cam bar was also changed to control chamfering tool

Two air clamps in pot fixture eliminate distortion of cast-iron cylinder sleeves during rough reaming operation. Pressure regulator in air-supply line permits easy control of clamping pressure on cylinders. Foot valve operates cylinders for clamping and unclamping

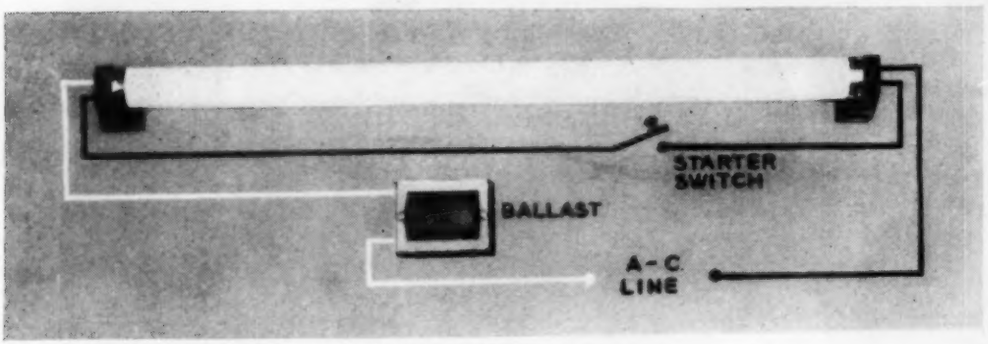


Two-ton toolroom hoist support can be moved to machines to shift work around and set fixtures in place. The A-frame carries a trolley runway that allows lateral movement of the hoist. Production machines are also set up with the welded hoist-supporting frame



Telescoping parallel-bar holder is permanently mounted on Allen drillpress table. Front bar is fastened to 1½-in. rods which fit inside tubes fastened to rear bar. Support blocks bolted to rear edge of table hold larger tubes into which smaller tubes and rods fit. Setscrews hold the two 2x3x34-in. bars in place to clamp work and prevent rotation

Welded-steel racks with pins on top and holes on bottom of legs hold production fixtures in storage. The 38x48-in. units are 42 in. high and can be stacked three high with lift truck. Stacks are angled at 45° to main aisles to make them convenient. Small fixtures and dies are removed with ladders



Fluorescent-lamp circuit fundamentally includes lamp, starting switch and choke-coil ballast

TEST YOUR OWN FLUORESCENTS

Efficient maintenance of plant lighting circuits requires only test panels, sample circuits and control components that can be set up in any size plant

By L. R. KEIFFER and C. L. AMICK
Engineering Division, Lamp Department
GENERAL ELECTRIC CO.

AN article on testing lighting equipment in the shop would hardly have been written 10 or more years ago. Then, a simple test board mounting a medium-base socket, a mogul-base socket and clip leads or terminals for connecting fixture leads was adequate to check incandescent lamps and fixtures.

If a filament lamp does not light when power is applied, the one positive conclusion is that the lamp is defective. No such conclusion can be made about fluorescent-lamp circuits. The lamp is only one of three basic elements, and only one of many possible failure points. Because of this, most fluorescent test equipment is made to help find the troublesome component. Replacement, after the weak link is found, is as simple as it is in filament circuits.

Fundamental Circuits

Reduced to its minimum essentials, a fluorescent circuit consists of starting switch, lamp and ballast. Starting switches in standard fixtures automatically connect the two cathodes in series, the function of the switch diagrammed above. After a short preheating period they open for normal operation.

Such starters are made up of a glow- or thermal-switch element inside a small metal can. Most have two terminals inserted in a plastic receptacle, called a "starter block." "No-Blink" or "Watch-Dog" starters are similar, but also incorporate a cut-out element to stop blinking toward the end of lamp life.

Ballasts also take several forms, depending upon the lamp size, supply voltage and number of lamps in the circuit. Most shop equipment involves 2- or 3-lamp ballasts for 40-watt lamps, or 2-lamp ballasts for 100-watt lamps in one circuit. The ballast label usually includes a wiring diagram applying to the specific design.

Occasionally, industrial reflectors have two 40-watt instant-starting fluorescents. The wire connecting the two cathodes is a shorting strip located inside the lamp-base shell. This opens the primary circuit when either lamp is removed—a safety feature desirable with the high open-circuit voltages of instant-starting ballasts.

Testing Facilities

Design of a test panel depends upon the sizes of lamps in the shop. Most installations have 40- or 100-watt lamps in overhead reflectors, with an occasional 15- or 20-watt local or "machine" light. Offices may also be lighted by the smaller sizes. The test board should be equipped to take up to the largest lamp in general plant use. By mounting the panel a few inches from the wall, it is possible to locate the ballasts out of sight.

Although checking new lamps and starters before being placed in service is usually unnecessary, the facilities will be convenient for testing lamps that do not perform well in given fixtures. Starter tests are also essential. A setup duplicating that given on the ballast label can be made on a separate board, or it can be added to the lamp-test panel. Insulated clip-leads, preferably color-coded, form convenient connections.

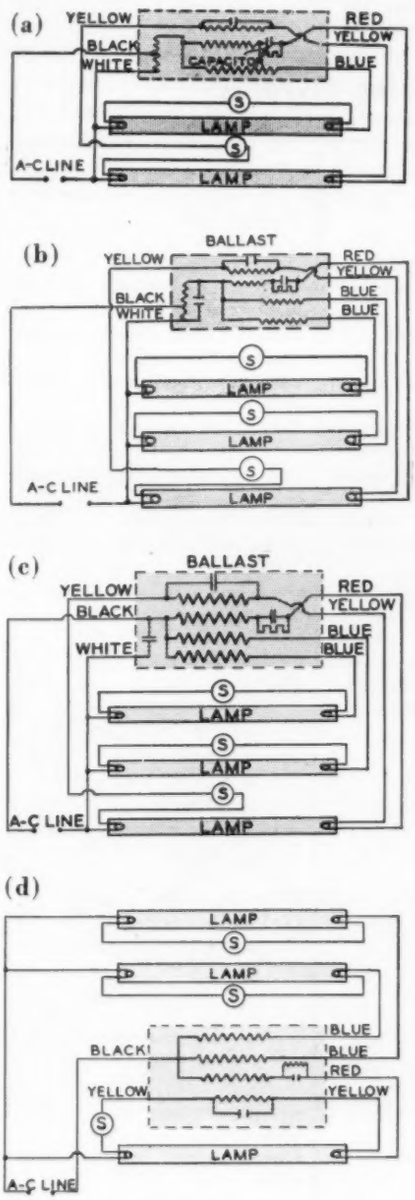
A simplified starter and ballast test layout is easily constructed. A filament lamp is connected in series with the proper starter socket and ballast. Low-value ballasts and starters are checked with a 40-watt, 115-volt filament lamp, and the 100-watt setup employs a 200-watt filament lamp.

Starter operation is correct if the filament lamp blinks as the starter

opens and closes. A steady light indicates a short, and no light at all shows that the switch is not closing. In either case the starter is inoperative.

Ballasts are tested by connecting them with a filament lamp and a dummy starter. The dummy is made by removing the metal can from a defective starter, connecting the two starter terminals, and clamping the can back in place. Following the wiring color code, the two red leads are clipped together. In newer ballasts, there may be one each of red, blue and yellow leads, in which case the red and yellow are connected. The filament lamp should light, with its brightness proportional to the wattage ratings of the lamps for that circuit. Then the yellow panel wire is connected to the blue ballast lead. Light now indicates that the lag-circuit reactor is continuous.

With 100-watt, 2-lamp ballasts without yellow leads, the yellow panel wire is connected, first to the red ballast lead, and then to the blue.



40-watt ballast variations include: (a) 2-lamp, (b) 3-lamp for 110-115 and 240-280 volt systems, (c) 3-lamp for 119-216 and 220-250 volts, and (d) short 3-lamp for 119-216 and 220-250 volts.

Checking New Fixtures

(Operative lamps and starters are assumed)

Symptom	*Cause*	*Remedy*
No starting effort or slow starting	Poor contact in lampholder	Twist lamp in holder, or replace socket
	Defective or improperly designed ballast	Replace ballast. ETL-approved ballasts are rated for lamp size
	Lamp cathodes have burned out instantly	Check wiring for ground
Lamp ends remain lighted		Recheck starter, check wiring
Test lamps blink	Low ballast rating	Check ballast
	Loose contact	Check holders and wiring
With 2-lamp ballast, one lamp starts, other blinks	Criss-crossed starter leads	Correct wiring
Spiraling, swirling, snaking	New test lamp	Turn lamp on and off a few times
	Starting compensator omitted (none required on 100-watt, 2-lamp ballasts)	Use ETL-approved ballasts
	Ballasts improperly designed	Use ETL-approved ballasts
Unequal brightness	Low supply voltage	Check voltage
	Improperly designed ballasts	Use ETL-approved ballasts
Unusually loud hum	Overheated ballast	
Overheated ballast	Short in ballast	Replace ballast
	High ambient temperature around ballast	Refer to fixture manufacturer
	Defective wiring	Correct wiring

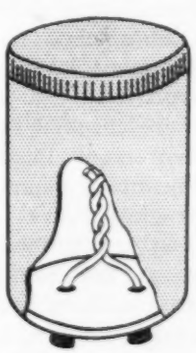
Checking New Fixtures

Some service shops may check new equipment before it is put in service. For this purpose, a pair of insulated clip-leads are connected to the power circuit of the right voltage. Fuses and an on-off switch are added.

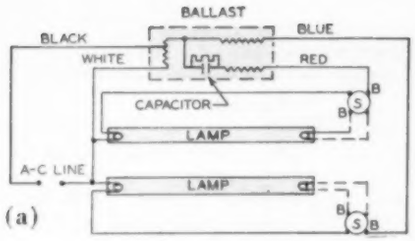
Previously tested lamps and starters are necessary to the test setup. With rated voltage applied, the lamps should light in a few seconds. "Cold" starting—a short preheating period—results in rapid deactivation of the cathodes. Long preheating periods reduce lamp life and cause early end blackening, especially with high starting currents.

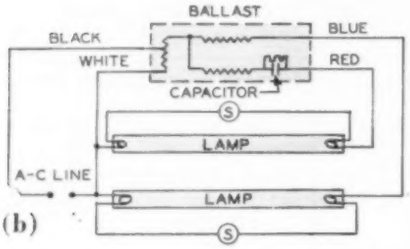
Lamp and Starter Inspection

If each end of a lamp, with either manual or automatic starting, develops a glow in a second or two, the cathodes are intact and

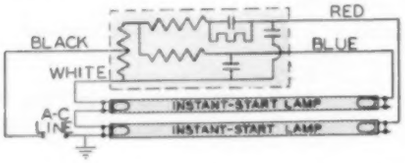


Dummy starter is made out of defective component. Connected terminals complete circuit continuity for manual testing





100-watt, 2-lamp ballasts: (a) 4-terminal starter sockets. "B" represents brass terminals. Dotted lines indicate internal wiring. (b) 2-terminal sockets

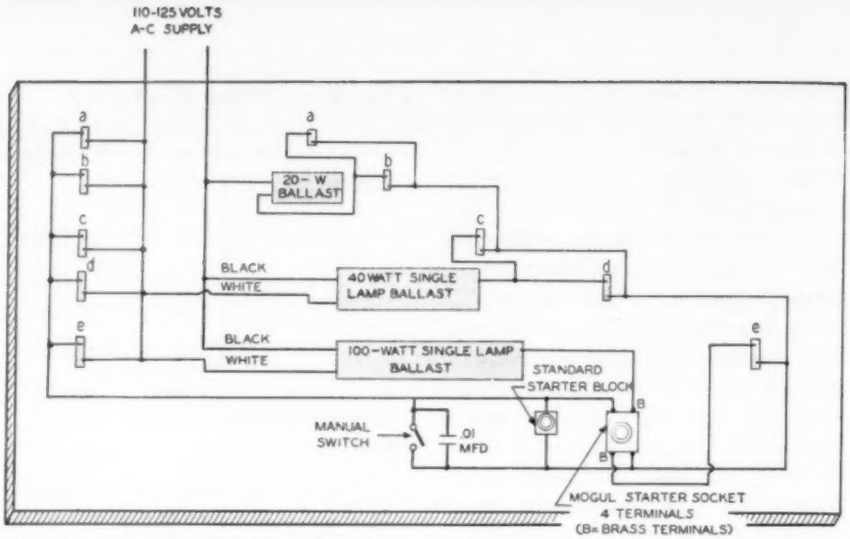


Instant-starting ballast with two lamps connected

active electrons are present. Absence of the glow, even though the cathodes heat to a dull red, indicates a leak or a loss of the activation material. This is usually accompanied by end blackening.

If the cathodes do not heat, one or both may be open-circuited. A continuity tester—a filament lamp in series with a fluorescent socket—will check this. A good fluorescent lamp is inserted in the socket. Small T-5 fluorescent lamps can be checked with a 25-watt filament lamp, the 15-40 range checked with a 60-watt incandescent, and 100-watt tubes checked with a 200-watt filament lamp, all used on a 115-volt supply.

Starters are checked by placing a good fluorescent lamp in the panel and inserting a starter. If the lamp ends glow but it does not start, the starter is probably shorted, either at the condenser or switch contacts. If no heating develops in a known good lamp, the starter is inoperative. Blinking in a good lamp can indicate a faulty starter, loose socket connections or a low temperature.



Test board handles standard lamps. Back-to-back distances between lampholders are: for 15-watt (a) 18 in.; 20-watt (b) 24 in.; 30-watt (c) 36 in.; 40-watt (d) 48 in.; 100-watt (e) 60 in.

Checking Operating Fixtures

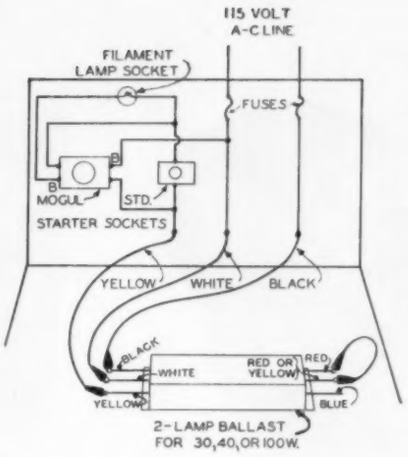
(Fixtures are assumed to have performed satisfactorily previously)

Symptom	*Cause*	*Remedy*
Lamp flashes, goes out, will not operate, ends black	Normal end of life	Replace lamp
Lamp ends blackened early in life	Defective starter Ballast improperly designed Line voltage high or low Loose circuit (causes blinking)	Replace starter Use ETL-approved ballast of properly-rated size Check voltage and compare with nameplate Check wiring and holders
Brownish rings at ends of lamps	Mercury condensation on bottom of lamp	Rotate tube 180°—is only temporary remedy
Dark lengthwise streaks	Characteristic in some lamps	None—has no effect on performance
Lamp ends remain lighted	Defective starter	Replace starter
Lamps blink	Defective or improper starter Low surrounding temperature or cold drafts Low line voltage Loose circuit Criss-crossed starter leads	Replace starter Use thermal-type starter or shield lamp Check and correct voltage Check wiring and contacts Check wiring
No starting effort or slow starting	Burned-out or inoperative lamp Starter inoperative Improper or inoperative ballast Burned-out cathodes	Replace lamp Replace starter Replace ballast Check wiring for grounds
Spiraling, swirling or snaking	New lamp Cathodes not preheating properly	Turn on and off a few times Replace starter, check ballast
Short lamp life	Some lamps fail early Improper or defective auxiliary equipment High or low line voltage Blinking Too frequent starting	None Check circuit for correct values Check voltage against nameplate Look for loose connections Consult life ratings for various burning periods
Low light output	Low line voltage Dust, dirt, oil on lamps	Check voltage Clean lamps

A portable test kit, designed after the wall-mounting panel but for only two or three of the commonly used lamp sizes, is useful in large plants. And many servicing problems can be handled with even simpler tools. A dummy starter can be inserted in a circuit where the original starter is suspected. Glowing of the lamp with the dummy in place indicates an inoperative original starter.

The dummy can be turned into the operating position for a few seconds to substitute for an automatic starter. For the difficult situation where a combination lampholder-starter is installed, a different starter can be substituted. In it, two wires connect a pushbutton switch to the starter terminals through a hole on top of the can.

If no indication of current is noted with a good lamp and a dummy starter, the fixture wiring should be checked. If this is correct and continuous, the ballast must be replaced.



Ballast or starter test panel is set on bench. Variation for single-lamp ballast check is black and yellow panel leads to black ballast leads

Electrodes of fluorescent lamps are rigidly constructed and the lamps can stand a lot of vibration. Precautions should be taken, however, to insure good electrical connections in vibrating installations.

Lamp Life

In addition to adequate testing facilities and trained service personnel, a well-planned maintenance program should be upheld. This includes the prompt replacement of burned-out lamps and regular reflector cleaning.

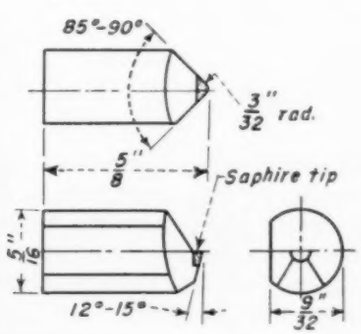
The number of times a lamp is started has a definite effect on its life. Average life can be calculated from published data on hours of operation per start. With this information, the number of expected failures can be computed for any length of time.

Some shops schedule regular replacements at about the time the average life span of lamps is up. Thus, a lamp is thrown out at about its expected failure period. The increased efficiency of the service staff, which can make regular replacement rounds, offsets the loss of useful lamp life in large plants and offices.

Finished gear teeth are held in chuck jaws for precision boring. Dial indicator checks close tolerances

Sapphire Tip Bores Bushing

BY C. C. SCOTT, Perishable-Tool Engineer, Fort Wayne Works, Motor Truck Division, International Harvester Company

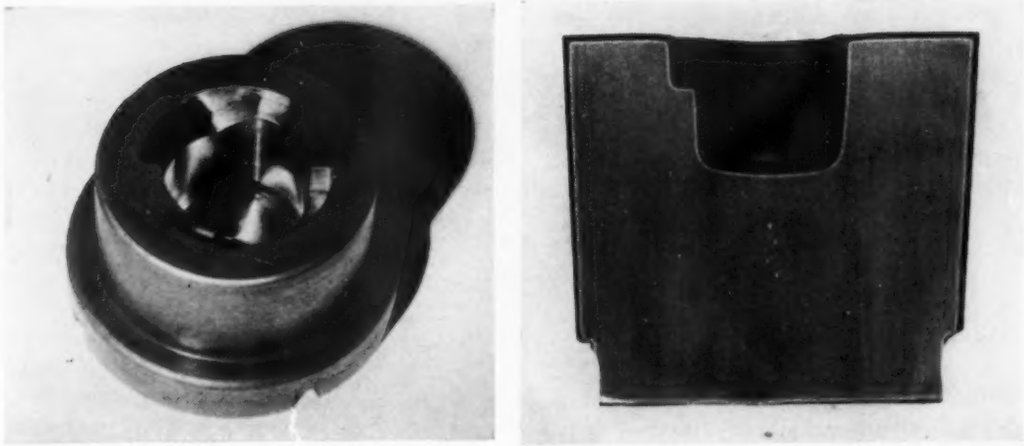


Sapphire tip is set in 5/16-in. dia. tool shank. Feed into bushing is 0.00466 in. per revolution

PROVIDING a finish comparable to that obtained by a diamond-tipped tool bit, a sapphire-tipped bit bores the brass bushing in a reverse idler gear for a motor-truck transmission at lowered cost.

The operation is done on a Heald No. 47-A Bore-Matic at 340 fpm. cutting speed. The 0.865- to 0.866-in. bore is finished in one cut that removes 0.015 in. of stock.

Bonded to the tool shank by a process developed by Sapphire Products Division, Elgin National Watch Co., the tip cuts a finish of 30 microinches on 20,000 brass pieces before lapping is necessary.



Virtually no wear is evident in hubbed cavity of a pushbutton mold (left) made of Type A air-hardening steel, although mold was used for an extended period on thermosetting plastics. Uniform casehardening is achieved (right). Case depth at cavity bottom is 0.061 in. Heat-treating cycle: carburize 4 hr. at 1750 F. in dry hydrogen plus 2% methane, cool in special atmosphere; refrigerate at —120 F. for 3 hr.; temper at 700 F. for 3 hr. Case hardness: Rockwell 57 C

BETTER STEEL DEVISED FOR HUBBING

Plastic-mold manufacturers can realize substantial savings by adopting an air-hardening steel

By A. L. PRANSES, Metallurgical Engineer
Material Engineering Department
WESTINGHOUSE ELECTRIC CORPORATION

TO AVOID quench-cracking and distortion, and to secure greater resistance to corrosion, abrasion and indentation, similar air-hardening hubbing steels have been developed recently by four manufacturers, working independently but practically concurrently (see table).

These steels, as compared with the commonly used hubbing materials, are easier to hub and to heat-treat. By virtue of their ability to retain hardness exceeding Rockwell 50 C at temperatures up to 900 F., these air-hardening steels may be used for making hubbed dies to mold the high-temperature plastics like duPont's "Teflon" and others, which do not flow properly at temperatures below 650 F.

The term "hubbing" denotes the process for manufacturing die cavities wherein a master die of hardened tool steel is forced into a block of soft steel to produce a cavity of the desired size and shape. (The process is also called "hobbing" by many.)

The hubbing process finds its widest application in the manufacture of molds for plastics and related materials. It is far cheaper than machining if more than one cavity of the same design is required, or if the cavity is so confined and intricate as to make machining very difficult. Careful hubbing techniques produce cavities exactly to dimension. If clean, fine-grained hubbing steels are employed, and master hubs are highly polished, virtually no hand-finishing operations are required on the cavities.

After the cavities have been hubbed, whatever machining is necessary is performed on the hubbing blocks. Then, they are case carburized, hardened and finished. The usual surface hardness range employed for plastics molds is Rockwell 50 to 60 C, the high side of this range being used for molding thermosetting plastics, while lower hardnesses are adequate for inspection-molded thermoplastics.

Materials Used

For hubbing blocks, relatively pure irons, very low in carbon and essentially free from alloying elements, have been used widely. These irons, while easily hubbed, carburize poorly, often distort badly or crack during heat-treatment, and retain a very soft core which usually leads to premature die failure arising from indentation of molding surfaces. Despite these many shortcomings, many tool and die manufacturers still use plain irons for hubbed dies.

Other manufacturers and users of hubbed dies demand greater core strength to increase die life. For this reason, the use of nickel-chromium steels, primarily SAE 3110, is widespread. SAE 3110 is fairly soft in the annealed condition, hubs easily, carburizes well and produces a core of moderate strength after heat-treatment. But SAE 3110 is essentially a water-hardening steel after carburizing, and, as such, is susceptible to quench-cracking and distortion during heat-treatment.

In 1946 and 1947, development work was under-

taken independently by four companies to produce a hubbing steel of improved properties, especially the ability to be air-hardened after carburizing. The discussion here will be confined largely to Type *A* steel developed by the author. This steel may be considered representative of all four air-hardening grades in respect to heat-treating characteristics and physical properties. Since SAE 3110 is most widely applied in this field, it will be used for comparison.

Necessary Properties of Steel

To be satisfactory for general application, a hubbing steel must possess the following properties:

1. Low initial hardness (in general, not greater than 126 Brinell).
2. Low rate of work hardening to permit heavy deformation with a minimum of intermediate annealing.
3. Satisfactory carburizing characteristics and hardenability.
4. Low distortion and quench-cracking tendencies during heat-treatment.

The hubbing steels in general use sacrifice some of these desirable properties in order to obtain others. Specifically, most previous hubbing steels display appreciable distortion and tendency to crack during heat-treatment by virtue of the severe quench required. Low core hardness after heat-treatment is also common.

The low distortion associated with air-hardening steels suggests that the optimum hubbing steel is one with sufficient alloy content to render it air-hardening after carburizing. Although low annealed hardness and high hardenability appear incompatible at first, closer study reveals that such is not necessarily the case. The problem is one of developing a steel with a composition excluding, to a maximum degree, all elements which contribute to ferrite (annealed) hardness, but including sufficient amounts of alloying elements which, in the presence of sufficient carbon, will result in air hardenability. At right are listed the common alloying elements of steel: first, in order of decreasing effect on hardenability; and second, in order of decreasing effect on ferrite hardness:

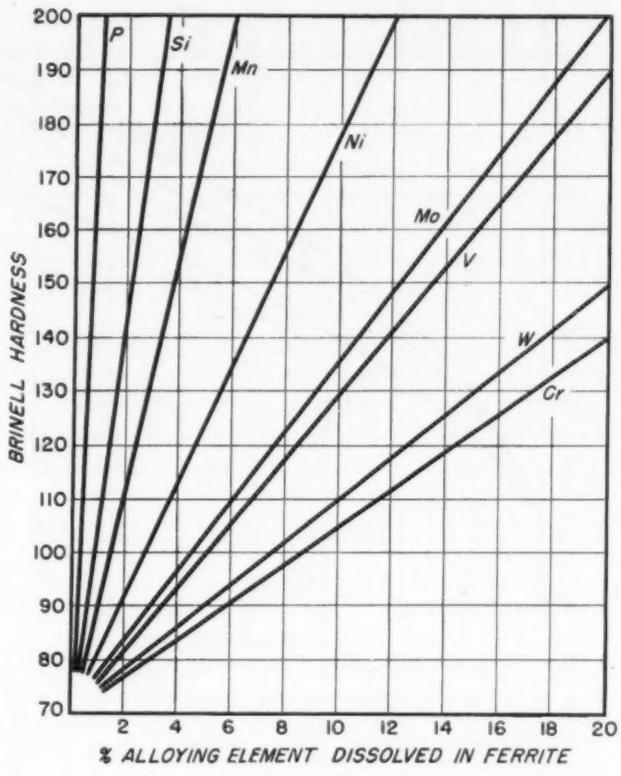


Fig. 1.. To develop a hubbing steel with sufficient alloy content, to render it air hardening after carburizing, the author took into account the effect of various alloying constituents on the ferrite (annealed) hardness. Source: E. C. Bain, "The Alloying Elements of Steel," published by the American Society for Metals

HARDENABILITY EFFECT	FERRITE HARDNESS EFFECT
Vanadium	Phosphorus
Manganese	Silicon
Molybdenum	Manganese
Phosphorus	Nickel
Chromium	Molybdenum
Silicon	Vanadium
Nickel	Chromium

A family of curves showing the quantitative effect of alloying elements on ferrite hardness is given Fig. 1. Note that the ferrite-hardness effect discussed refers to elements *dissolved* in ferrite. Of course,

REPRESENTATIVE HUBBING IRONS AND STEELS

General Type	Designation	Nominal Composition, % by Weight									Brinell Hardness Annealed
		C	Mn	Cr	Mo	V	Ni	Si	S	P	
Water Hardening	Ingot Iron	0.012	0.02	—	—	—	—	Trace	0.025	0.005	80–90
	Hubbing Iron	0.08	0.15	—	—	—	—	0.10	0.025	0.010	90–100
	SAE 3110	0.10	0.50	0.65	—	—	1.25	0.20	0.025	0.025	110–126
Oil Hardening	Type 1	0.07	0.40	1.35	0.20	—	0.55	0.20	0.025	0.025	105 Max.
Air Hardening	Type *A*	0.025	0.37	4.85	1.00	0.40	—	0.05	0.012	0.006	105 Max.
	Type *B*	0.09	0.44	4.92	0.53	—	—	0.22	0.012	0.010	116 Max.
	Type *C*	0.10	0.40	5.50	1.20	0.30	—	0.20	0.010	0.010	126 Max.
	Type *D*	0.07 Max.	0.30	5.00	1.00	0.40*	—	0.12 Max.	0.025	0.025	116 Max.

*Optional

Manufacturers:
Ingot Iron.....American Rolling Mill Co., Middletown, Ohio
Types 1 and D.....Crucible Steel Co., New York
Type *A*.....Westinghouse Electric Corp., East Pittsburgh, Pa.
Type *B*.....Bethlehem Steel Corp., Bethlehem, Pa.
Type *C*.....Carpenter Steel Co., Reading, Pa.

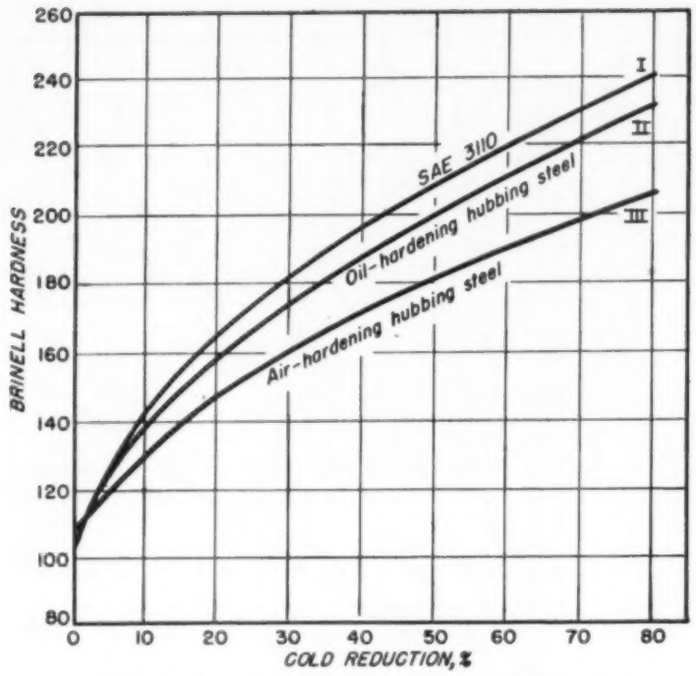


Fig. 2.. To avoid tearing the annealed hubbing block or fracturing the hardened hub, choose a hubbing steel with the lowest work-hardening index. Optimum results will thus be obtained

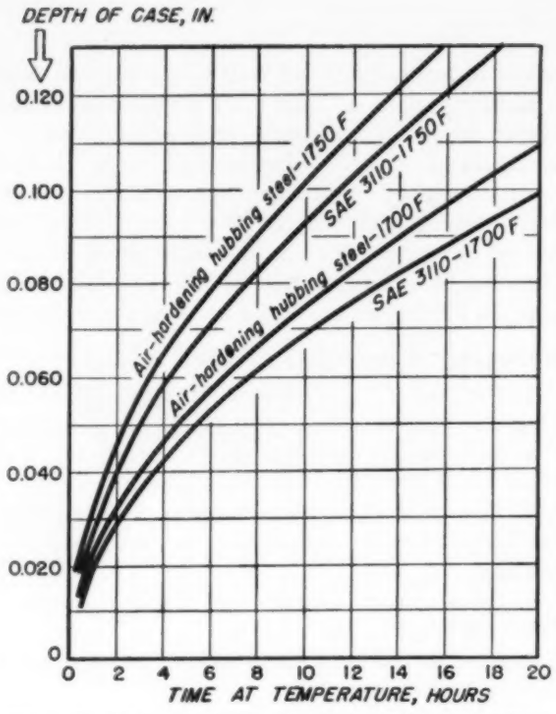


Fig. 3.. Type A air-hardening steel carburizes more rapidly than SAE 3110, retains suitable grain size despite long soaking. Carburization was accomplished in a dry hydrogen atmosphere containing 3% methane by volume

some elements may exist as intermetallic compounds; carbides, non-metallic inclusions, or dispersed as secondary phases in the ferrite matrix. Their effect on annealed hardness may be as great or greater than in solid solution. Carbon is such an element which, in annealed steel, exists primarily as a metallic carbide greatly to increase hardness.

From the above list, it is obvious that vanadium, chromium and molybdenum, which have a large effect on hardenability, yet a relatively small effect on ferrite hardness, are eminently suited for the desired alloy. The common die steel of the 1% carbon, 5% chromium, and 1% molybdenum type, which is strongly air-hardening, suggests itself as a model, providing the following precautions are observed:

1. Minimize the carbon content so that the annealed steel is low in metallic carbide.
2. Hold manganese as low as is consistent with good forgeability.
3. Minimize silicon, phosphorus and sulfur.
4. Keep vanadium on the high side, not only because of its hardenability effect, but also its recognized ability to restrict grain growth at elevated temperatures.

The air-hardening hubbing steel of composition *A* was developed on the basis of the above theoretical considerations. Properties of the Type *A* analysis, and their relationship to hubbing applications, are:

Initial Hardness

Initial hardness of a hubbing steel is of considerable importance, because it determines the initial load that must be applied to start penetration of the hub into the hubbing block. Since the alloy content (other than carbon) of the four air-hardening steels listed in the table is essentially the same, the annealed hardness is roughly proportional to the carbon content. The hardnesses listed in the table are those obtained by commercial annealing practice. Somewhat lower hardnesses have been produced by following the standard anneal with a spheroidizing sub-critical anneal. This practice is not practical from an economic standpoint.

Work-Hardening Characteristics

It has often been observed that, once a hubbing steel has work hardened to some critical value during hubbing, tearing of the steel or fracture of the hub will occur. Curves of hardness versus amount of cold reduction were plotted as shown in Fig. 2. The slope of the linear portion of the curve, expressed in points increase in Brinell hardness per percent cold reduction, may be called the "work hardening index" of the steel. The greater the index, the greater is the rate of work hardening. Indices thus determined are:

STEEL	WORK HARDENING INDEX
Air-Hardening Type *A*	0.94
Oil-Hardening Type 1	1.08
SAE 3110	1.23

It should be noted that initial hardness is no guide to the rate of work hardening that can be anticipated. Starting with a hubbing steel of reasonably low hardness (126 BHN or less), the rate of work hardening will determine the number of intermediate anneals which must be applied before a deep impression can be made. Therefore, it is apparent that a steel with the lowest possible work-hardening index should be used for optimum results.

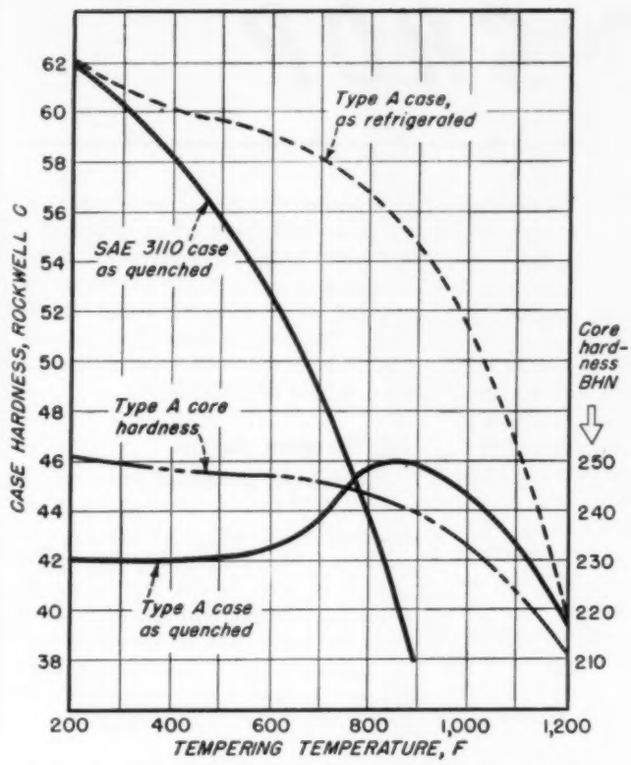


Fig. 4.. A case hardness of Rockwell 58 C can be obtained by refrigerating air-cooled Type A carburized steel at —120 F. and tempering at 700 F. These curves were developed by carburizing Type A steel at 1750 for 4 hr., using a hydrogen atmosphere containing 3% methane and cooling in air

Carburizing and Heat Treatment

The carburizing rate increases rapidly with temperature. For example, in carburizing-grade alloy steels such as SAE 3110, 8 hr. are required to carburize to a depth of 1/16 in. at 1700 F, whereas only about 5 hr. are required to produce the same case depth at 1750 F. The main objection to carburizing ordinary steels at elevated temperatures is that severe grain growth occurs, and some grain-refining treatment must be incorporated into the subsequent heat-treating schedule. This not only involves more heat-treating time, but also abets the occurrence of objectionable distortion or quench-cracking.

Air-hardening hubbing steels, such as Type *A*, carburize somewhat more rapidly than SAE 3110, as shown in Fig. 3, and retain desirable grain size despite prolonged soaking at temperatures as high as 1750 F. Apparently the vanadium content of Type *A* steel avoids excessive grain growth as shown below:

STEEL	HOURS AT 1750F.	ASTM GRAIN SIZE*
SAE 3110	10	2
SAE 3110	24	0
Type *A*	10	5-6
Type *A*	25	4-5

* Originally ASTM Size 6

After carburizing, hardening of Type *A* steel is achieved by cooling in still air. Due to retention of austenite, the as-quenched hardness is not likely to be higher than Rockwell 45 C. A hardness over Rockwell 60 C is easily achieved by refrigerating at —120 F, to transform the austenite to martensite.

Tempering curves for Type *A* steel are given in Fig. 4. A typical tempering curve for the carburized case of SAE 3110 is superimposed for comparative purposes. These conclusions may be drawn:

1. The as-refrigerated curve is similar in shape to that for the 1% carbon, 5% chromium, 1% molybdenum type die steel, but the Rockwell C hardness is a few points lower.

2. The marked secondary hardness of the as-quenched case at about 850 F. is attributed either to austenite transformation to some bainitic product or to martensite formation on cooling as a result of austenite conditioning.

3. The core does not display austenite-retaining characteristics, and the core tempering curves for as-quenched and as-refrigerated samples coincide.

4. Tempering at about 700 F. is indicated to obtain a case hardness of Rockwell 58 C, which is satisfactory for most hubbed dies.

5. A core hardness of 250 Brinell or more is obtained, and is appreciably greater than that obtained with hubbing steels in current use.

The ultimate refinement in heat-treating of air-hardening hubbing steels is to carburize in a carbonaceous atmosphere (such as dry hydrogen plus 2½ to 4% methane), followed by cooling in a special-atmosphere-protected cooling chamber. This method produces dies case carburized, hardened and ready for use with virtually no further finishing.

"The advertising campaign on this new gadget we're making calls it sensational, the latest and greatest development—and I found it isn't half bad, actually, myself."

TALKING SHOP

Potential Black Eye

EPHRAIM FREEDMAN, director of Macy's bureau of standards, had several complaints about plastic materials at the recent SPI meeting. Among others, he decried use of reprocessed plastic in such items as garden hose, said plastic handles for cutlery are currently too thin, too soft, and are insecurely cemented. Acrylic counter fixtures crack when dropped, striped and marblized pens and desk sets have lost favor to plain colors, clear plastic food containers show stains removable only with an abrasive. Such corner-cutting by the few spells eventual trouble for the whole molding industry.

Splitting the Punch Marks

ABOUT HALF of current railway-car production is of the "all-welded" variety—which means all except the grab irons and certain other safety elements on which riveting is still the AAR requirement. Thus you may be interested in the accompanying changes which strike the eye and ear of the old-time car builder. In our visit to the ACF shop at Huntington, W. Va. (building 6000 all-welded 70-ton hopper cars for the C&O at 25 a day), we noted these things:

The clatter of chippers, clang of plates and slam of sledges are still there, but the ear-splitting racket of the riveters is gone. The men on the line are not soaked with sweat, but they're assiduous goggle wearers—as you'd better be—for as many as 15 arcs may be sputtering at one station.

Cars are no longer built "from the track up;" they're built of subassemblies put together in accurate fixtures. That's as it should be; you can't pull up a half-inch gap with barrel pins and fit-up bolts when the holes for them aren't there. The holes could be punched; but they'd have to be filled later. Hence almost no fast-thread bolts and no barrel pins; clamps are used instead. All light clamping is done with fast-acting lever clamps; heavy clamping is done with screw C-clamps, but they're run up with impact wrenches.

To assemble heavy sheet sections, lugs are welded on. They have holes for a prybar and act as gages as well; are cut off after tackwelding. Any permanent numbers or letters are put on by laying a weld bead. Templets and jig plates position parts or subassemblies added. Hoists take out the back-breaking labor.

The press shop can't work to chalk lines and "eyestimates" either—tolerances are 1/64 in. or closer. Shears are in close adjustment, blades are sharp. Hydraulic holddowns replace mechanical ones for surer holding. All edges of each sheet are trimmed; gaging is done by pin and edge. Blanked sections are sheared in one smack with special-shape dies—no series of haphazard chops. Punches and bull riveters stand idle. "Splitting the center punch marks" is no longer an ideal; it's the custom. The result is cars that are true duplicates, with weight range only 400 lb. instead of 600 to 900. Total car weight is down 1½ to 2 tons also, a real saving in haulage costs; while life is up 15 to 20%.

Money-minded

CONTRAST between the Henry Ford days when the Ford organization was *product-minded*, and the Henry Ford II days, when Ford men have become *business-minded*, is presented by this Detroit yarn: An old Ford customer ran into a Ford executive at a dinner party, reminisced about the good old days when a friend of the right brasshat could drive out to Rouge and get almost anything—including a new motor—put in for free. The Ford executive smiled. "Yes," he said, "but now we're running it as a BUSINESS!"

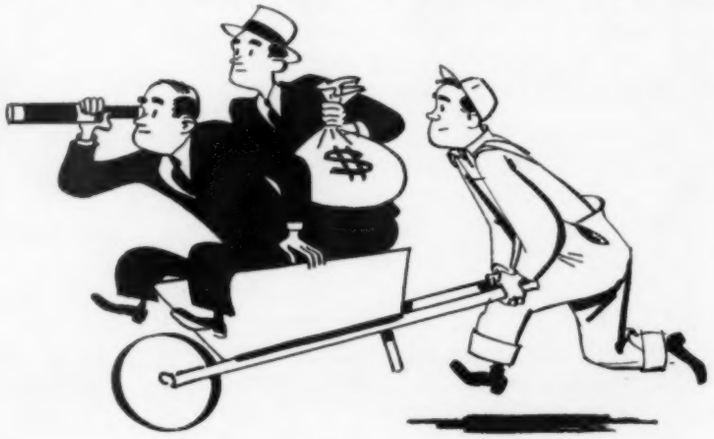
Air Cooling Again

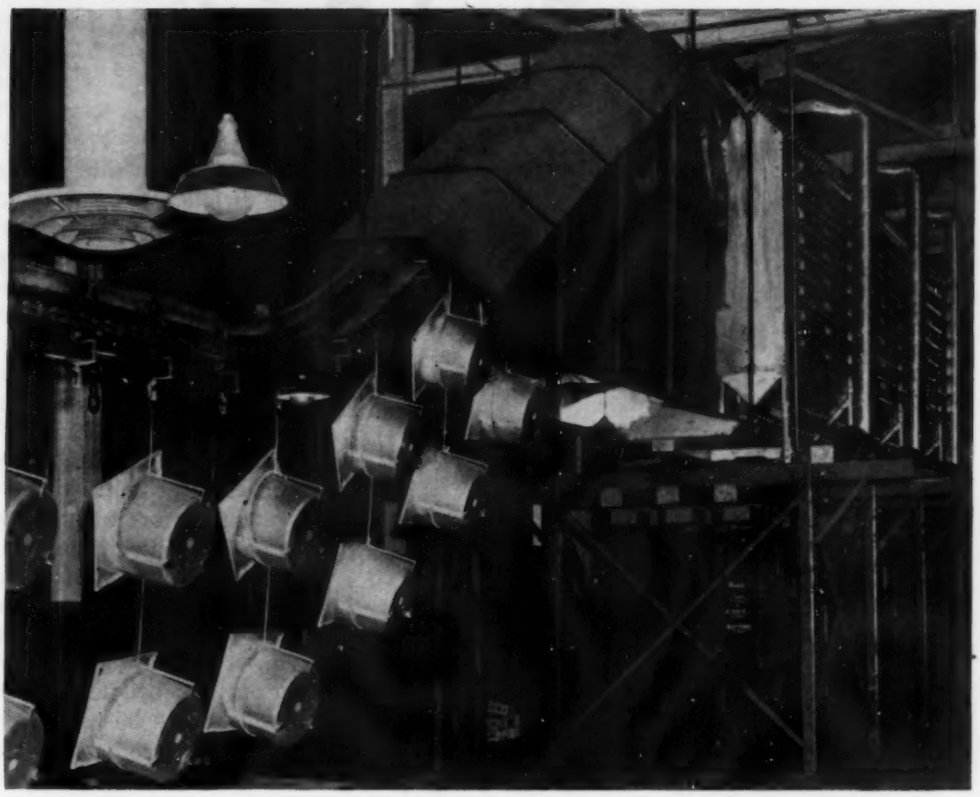
CONTINENTAL MOTORS has developed a complete line of aircooled military engines from 125 to 1040 hp. Air cooling avoids difficulty of getting water in both desert and arctic operations. Greyhound has also developed a new bus to use aircooled engines. These trends mean much more cylinder machining—techniques like those for aircraft engines.

Who Helps Most?

WHO IS MOST IMPORTANT: Worker, management or stockholder; production, engineering or sales? GE recently cited a fable that applies in both cases. An old Arab chief told his three sons the one who would bring him the most valuable present was the one who loved him most. The three sons met in a distant city and compared gifts. The first had a glass which showed what was going on anywhere at any time, the second a carpet which would carry him and others anywhere, the third a medicine which would cure any disease.

The first saw in his glass that his father was deathly ill; the second carried all three home on his carpet; the third gave his father the medicine which saved his life. The old Arab found himself unable to choose the most valuable gift. Can you?





Baked finishes are usually preferred when maximum durability and hardness are desired. Latest technique uses the infrared lamp to act as an easily controlled heat source

HOW TO

PAINT the PRODUCT

(PART 2)

BY H. E. LINSLEY, ASSOCIATE EDITOR

IN THIS second and concluding part of the Special Report on product painting, attention is given to the highly important techniques involved in brush painting, and to the care and maintenance of bristle and synthetic fiber brushes. Dip painting, roller coating and centrifugal painting are also considered, as is the use of an electrostatic field for detearing.

The various types of spray booths and baking ovens are discussed, and information is given on methods of inspection. Safety precautions to be observed in the work areas, both in the matter of equipment and by the operating personnel, are briefly outlined.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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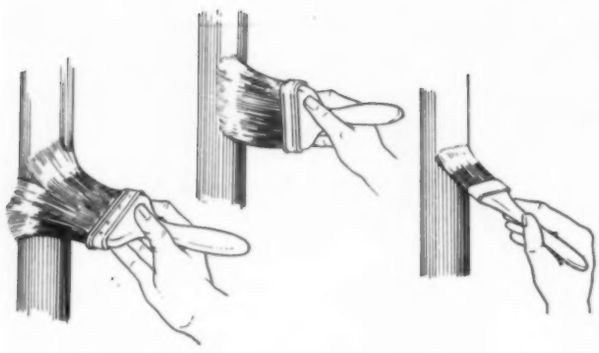
Brush Painting



Too wide a brush used on a narrow surface will ruin the center bristles and cause fish tailing. Using a brush edgewise will cause fingering. A narrow trim brush should always be used for narrow work

DESPITE all the advances made in the mechanical application of paint, the familiar paint brush continues to occupy a most important place. Its use in the production of first-class work demands a much higher degree of manual skill than do any of the mechanical methods, but its complete flexibility and simplicity make it a prime favorite where volume production is not involved, or where the expense of compressors, spray booths, and other equipment cannot be justified.

Aside from operator skill, the most important factor to be considered is the brush itself. A good job demands a good brush, and while good brushes are not cheap, they will do better work and have a much longer life than inferior ones.

Mere purchase of a good quality brush, however, is not sufficient. The type must also be selected to suit the job in hand. Large brushes are needed for large surfaces to carry a full load of paint and give maximum coverage; chisel edge brushes should be used for painting to a definite line and where surface irregularities are encountered. A regular paint brush should not be used for varnish or lacquer; special brushes are available for this type of work, and will produce much better results. For narrow work a narrow brush is imperative, as the use of a wide brush will cause excess wear on the center bristles and eventually give the brush a fish-tail appearance, rendering it useless for further work. For round work in particular, as on pipes, the brush should always be narrow enough that its entire edge is in contact with the work during the painting stroke. This will save both time and effort.

When painting, the brush should be held lightly, like a pencil, and should make a 45° angle with the work surface. It should never be poked or jabbed into corners or holes; this practice will result in broken, bent, or matted bristles. Nor should a brush ever be used edgewise; a flat brush is intended to be used on its flat side, and using it edgewise will cause the bristles to gather together in small bunches which will not return to their natural place when the brush is again used properly. This condition is known as fingering and can also be brought about by drawing the brush edgewise across the paint pot to remove excess paint.

Paint for brushing should be prepared in the same manner as for spraying, although the consistency is usually thicker. Manufacturers make specific recommendations for each different type of paint, but, in general, the consistency should be about that of cream. The ordinary can in which paint is purchased is not a good container to work from, and a regular, straight-sided, rimless paint pot equipped with a wire bail will be found more satisfactory. Repeated drawing of the brush against the sharp edge of the rim of an ordinary can to remove excess paint tends to cut the bristles and shortens brush life. Excess paint should be removed by patting the flat side of the brush against the straight side of the pot and drawing it upwards. When painting is finished, surplus paint remaining in the pot should be poured back into the regular container, and the pot cleaned out so it will be ready for reuse the next time.

Bristle Brushes

The finest grade brushes have always been made exclusively from hog bristles, the greater part of which come from China or Siberia. The China bristles are taken from old hogs and are long and exceptionally tough. Russian bristle, once the staple of the industry, has deteriorated during the past 30 years, as the emphasis in that country is now on meat hogs, and since 1917 bristles have been taken from younger stock and have not the same strength as the Chinese.

Several grades of bristle are available, each named from the province from which it comes. Tientsin and Tsingtau are soft grades; Manchurian, while still soft, is stiffer and heavier; Hankow and Shanghai are medium stiff; and Yunan and Chungking are the stiffest grades. Russian bristle is hard wearing and is desirable for the rougher and coarser jobs.

Enlarged view of bristle ends, showing flags on (1) Russian Siberian yellow, and (2) Black Chinese bristle. Absence of flags is apparent on (3) Horsehair and (4) Vegetable fiber

Lower-grade brushes are made from fiber or horsehair, but these are not very satisfactory. They do not have the ability to hold an adequate quantity of paint, their spreading power is poor, and the fibers tend to swell, break easily and have a short life. Medium-quality brushes are frequently made from a blend containing up to 30% of these non-bristle fibers and while they are satisfactory for some work, they cannot compare with the 100% bristle brush for carrying and spreading ability.

A particular feature of the natural bristle lies in the microscopically branched ends, known as flags. These have long been regarded as responsible for the superior paint holding and spreading qualities of natural bristle. Recent investigations, however, seem to indicate that the flags are not responsible for this superiority, but that it is due to the natural scaly surface of the bristle. This contention would seem to be borne out by the fact that a natural bristle brush will continue to produce fine work long after the flag ends have been worn away by continued use.

A new brush should not be used in the as-received condition. It should be slapped against the palms to free any loose bristles. These will work up above the body of the brush and can be picked out. Then the hand should be run vigorously through the bristles to make sure the brush is clean, and finally the bristles should be combed straight. A new brush should never be put into water; for best action and best service life it should be suspended in raw linseed oil for 48 to 72 hours. The porous bristles absorb the oil, thus sealing themselves against moisture and thinners, both of which tend to make bristles soft and flabby. Soaking a new brush in linseed oil also makes it easier to clean, as paint does not readily harden or oxidize to oil treated bristles. If the brush is to be used in a material that does not contain oil, the linseed oil must be cleaned out before the brush is used.

To load a new brush it should not be plunged into the paint, but rather dipped slowly and gradually, allowing the bristles ample time to absorb the paint. This should be repeated several times until the brush has absorbed a full load, but it must not be dipped deep enough that paint will get into the heel. These simple precautions will substantially increase brush life and will tend to prevent fingering.

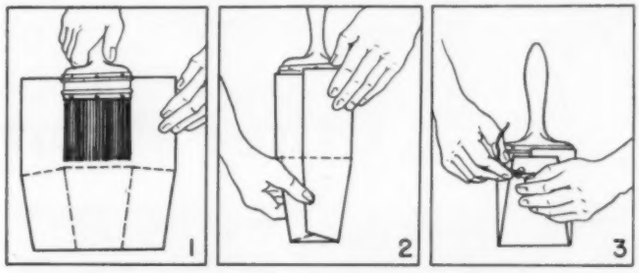
Brushes should never be stood on end when not in use. This bends the bristles and flag ends and makes the brush difficult to work with, besides lowering its effective life. Most emphatically, brushes should not be stood in water; this tends to soak into the bristles, making them soft and flabby. When temporarily out of use, brushes should be suspended by a wire through the handle in a container of paint or solvent. When a job is finished the brush should be carefully cleaned, dried, and wrapped in heavy paper, thoroughly soaked in linseed oil.

Cleaning Brushes

A used brush should be washed in a good grade of thinner to loosen all particles of paint. An ample quantity should be used, but this need not be wasted; it can be poured off into a closed container, allowed to settle, and decanted into another container for further use. If the brush has been neglected and is hardened up with paint, it may be necessary to soak it in thinner for several hours. Softened paint should be removed by the use of a blunt putty knife, and then the brush should be washed thoroughly in hot water and a good neutral soap—strong alkaline soaps will injure the bristles. A good scrubbing will remove all traces of paint. Alternate rinses in warm and cold water should be given to remove all soap, and then the excess water must be shaken out. Do not beat the brush against any object to remove the water, as this may cause serious damage.

After the brush is free from excess water the bristles should be combed straight and the brush wrapped in heavy paper, making sure that this is not so tight that it will bend or curl the bristles. The brush must be thoroughly dry before it is used again, otherwise the new paint will seal the moisture in the bristles, causing them to lose their resiliency and become floppy.

Remove loose bristles from a new brush by following these three steps: (1) Tap brush against palm of hand, (2) Twirl brush between palms, (3) Pull out loose bristles



Stored brushes should be wrapped in heavy paper and tied with a string to protect against dirt and injury. Avoid bending ends of bristles when folding paper

Synthetic Bristle Brushes

Relative newcomers in the paintbrush field, the Du Pont nylon, Goodyear Pliofilm, and Pittsburgh Plate Glass Co. Neoceta "bristles", have already assumed an important place. They have almost the same resiliency as hog bristles, greater uniformity, more resistance to solvents and water, much more durability, and will outwear hog bristles from three to five times. Each filament is carefully pointed at its working end and roughened or fluted to improve its paint holding qualities.

They can be used for applying any type of paint except those containing cresol, phenol, carbolic or

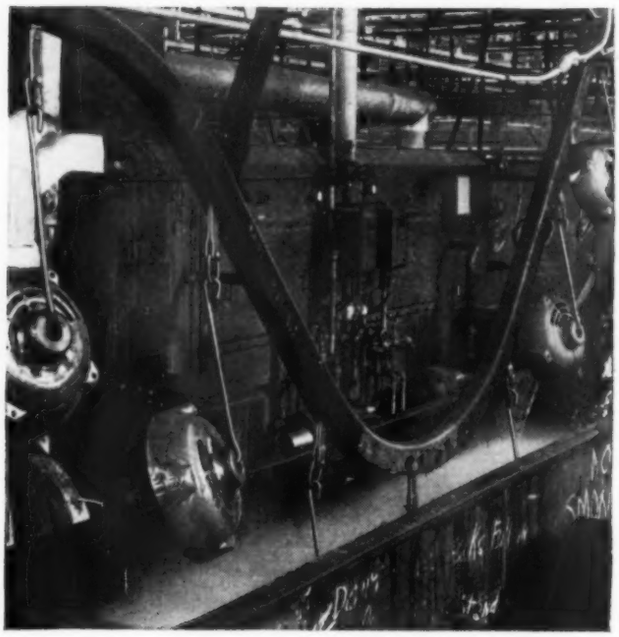
formic acids. These will dissolve the filament in a short time, but they are not found in most ordinary paints. Apart from these, synthetics are inert to most other solvents, and very resistant to alkalis, general chemical substances and vermin. Some types, however, are damaged by lacquer.

No breaking-in is required, but it is advisable to check a new brush for loose filaments. In very hot weather or on very warm surfaces, the resiliency may be affected somewhat, but this can be overcome by dipping the brush in cold water, shaking out the water and resuming work. Alcohol also tends to soften the filaments after prolonged exposure, but this has no permanent effect. Resiliency can be restored by washing in hot soapy water, rinsing and drying thoroughly. Bent, fingered or spread brushes can also be restored in the same way.

The same care and cleaning should be given to synthetic fiber as to bristle brushes, with this notable exception, that they can safely be left standing in water when not in use, provided, of course that they are not resting on the filament.

Turpentine is the best brush cleaner for oil base paints. Benzine, kerosene and white gasoline rank next in order. Shellac should be washed out with alcohol; water paints with water only; lacquer with lacquer thinner. For synthetic enamels, use the solvent recommended by the manufacturer.

Other Painting Methods



Conveyorized dip tank in which motor end frames are automatically dipped in priming paint as they leave the wash machine and travel toward the ovens

ALTHOUGH spray and brush painting account for the major part of finishing work, other methods are in use for special applications. For flat sheets, roller coating is commonly used. In this process the sheet is fed between two or more rollers which spread the paint over the surface. By making up the paint roller with several separate sections it is possible to apply different colors to different sections. Decorative effects can also be obtained by using a pattern on the roller. Wood grain effects are frequently obtained in this manner.

Dip coating is probably the simplest of all coating methods, and consists merely of dipping the objects into a tank of paint, allowing the excess to drain off, and then drying. For production work, the process is usually mechanized, the parts being suspended from a conveyor, either individually or in metal baskets, and immersed by causing the conveyor to take a sharp dip over the tank. As the conveyor lifts the parts out of the tank, it carries them over a drainage area where the excess paint drips off, and then takes them directly into the baking ovens, or drying area, whichever method is being used.

Disadvantage of the process is that if the parts contain cavities, these may trap air and remain uncoated, or may trap and carry out substantial quantities of paint. Another disadvantage is that beads or tears of paint tend to cling to the edges of the part and present an unsightly appearance. This latter, however, can be overcome by attaching the suspension hook to a free-running roller and passing this between power-operated rollers near the end of the drain area. This causes the part to spin rapidly and throw off the tears by centrifugal force. Precautions must be taken against splashing.

An improved method of detearing uses an electrostatic field. After the work has been dipped it is carried over the usual gravity drainage area until

Hand dipping in open tanks is still a widely used method of applying paint and requires a minimum investment in equipment, but losses by evaporation tend to be high

the flow of paint has virtually ceased. Then it is passed over an electrostatically charged metal grid. The work is grounded and positive, while the grid is negative and is maintained at a potential of about 85,000v. An attractive force is thus exerted on the work, and any excess fluid paint is attracted to the grid from the drainoff points. Parts so treated will have a very uniform appearance.

Care must be used in hanging the work to insure that it is well grounded electrically, and that it does not approach closer than about 8 in. to the grid. Otherwise the unit will be de-energized because of the tendency to create a static spark, and work will pass through the unit without being deteared. The grids should be made removable to permit cleaning off paint deposits, and the detearing area must be well ventilated to carry away solvent vapors.

Small parts are sometimes treated by centrifuging. The work is loaded into baskets, dipped in paint, and allowed to drain for a short time. The basket is then placed in a centrifuge and whirled for about 30 sec. in one direction and 30 sec. in the opposite direction. After shaking the basket to prevent sticking, parts are transferred to the oven for drying in the usual manner.

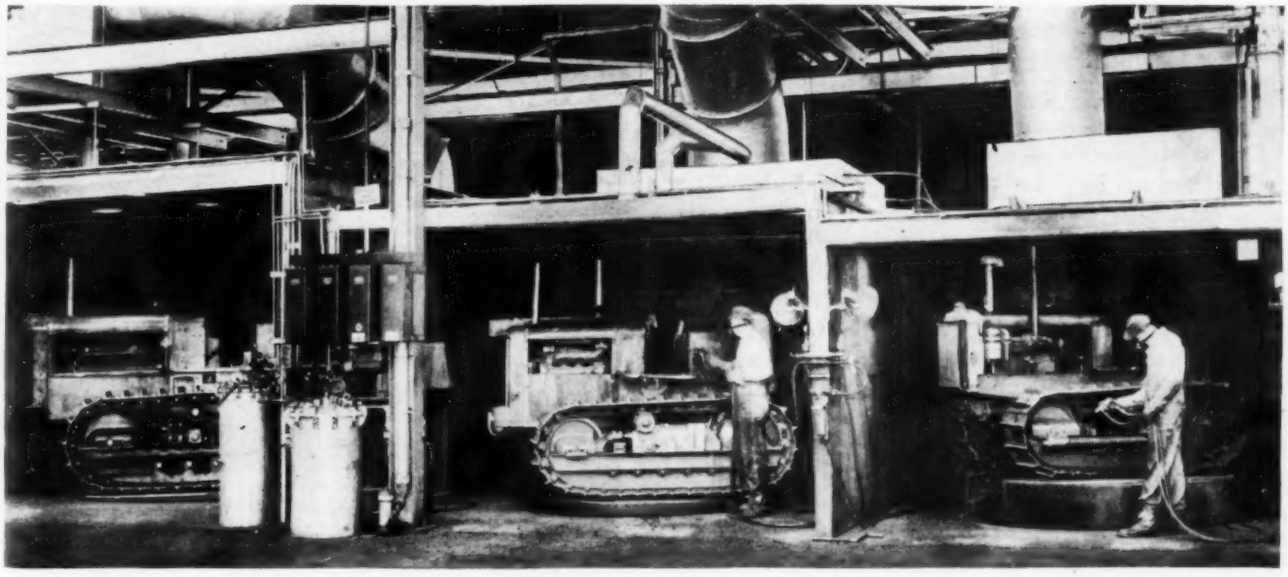
Small, lightweight parts that have no tendency to nest together are often coated by tumbling in rotating barrels. The process is used most commonly with lacquer, and consists of applying a small quantity of lacquer to the inside of the barrel and tumbling the parts at about 30 rpm. Cup-shaped parts will become coated on the outside only, and a continuous film will not necessarily be formed, hence the process should not be used for the better grades of work on which quality is of major importance.

Electrostatic detearing is accomplished by passing the work over a metal grid carrying a high negative potential. Paint tears or droplets are pulled from the work to the grid and a uniform surface obtained

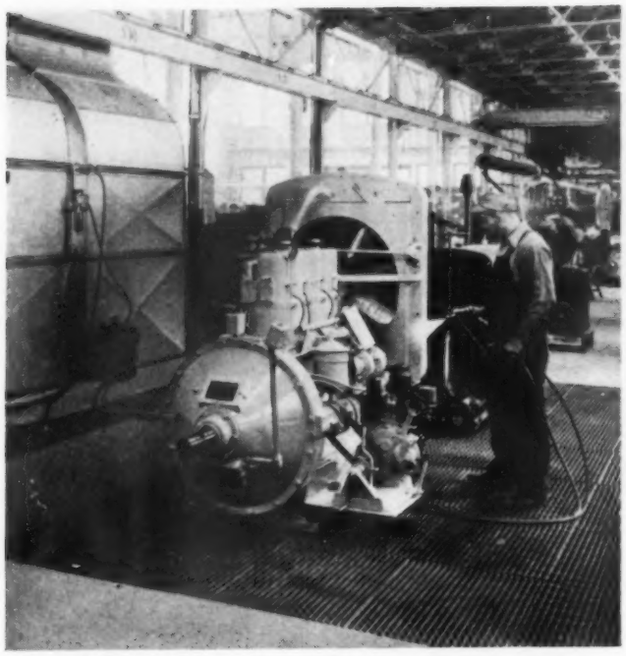
Paint Booths

BECAUSE of the toxicity, volatility and flammability of most paints and solvents, painting should not be performed in the open shop unless adequate ventilation is provided and employees are safeguarded against breathing fumes. Special precautions must be taken against fire. Properly designed metal spray booths offer the most satisfactory means of meeting the requirements of safety and convenience and the production of high quality work.

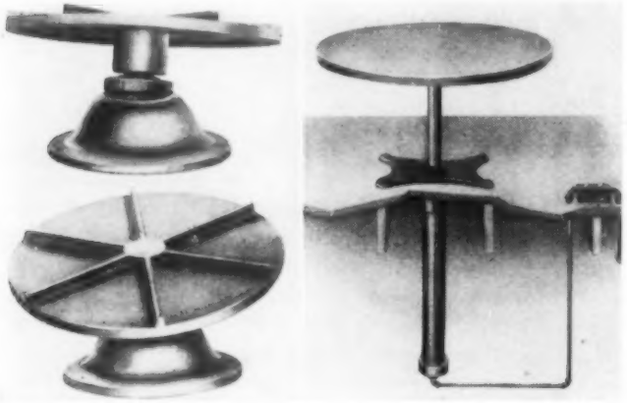
Where heavy parts cannot be handled into and out of booths, a strong grid may be let into the floor to support the work, and a powerful exhaust sys-



Dry type spray booth with work mounted on special, variable-height turntables. Air is exhausted from top and rear of booths



Downdraft suction system permits spraying large objects without an enclosed booth. Air makes an abrupt turn under the grid and allows paint particles to fall into a water trap



Pneumatic turntables, right, are adjustable for height by an air cylinder. They eliminate stooping and reaching when painting tall parts. Adjustable tilt turntables, left, make painting easier on small parts. Ribs tend to prevent a ridge of paint from forming at the bottom of the work but are not essential

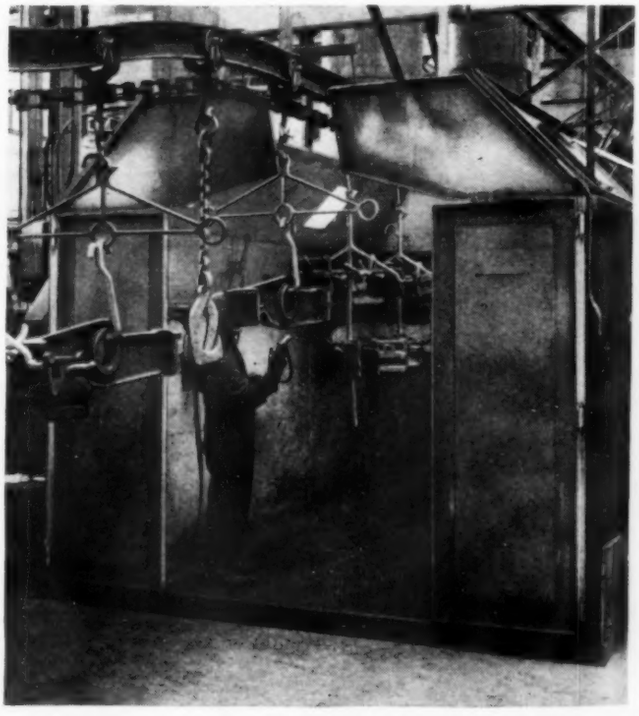
tem connected to draw the fumes downward. The same principle can also be used when smaller parts are manually painted on a bench. Small, sheet-metal booths, however, are available for bench work and are generally more favored, as they confine the fumes and overspray to a positive area.

Spray booths vary considerably in size according to the articles to be painted, and in their simplest form are merely a sheet-metal enclosure, open at the front and equipped with an exhaust fan. A manually operated turntable is usually installed to facilitate spraying all sides of the work without unnecessary handling. In the course of time the walls of the booth become heavily coated with paint, and this must be scraped off at intervals. This cleaning operation can be greatly simplified by covering the walls with large sheets of wrapping paper attached by adhesive tape. As they become fouled, they can be removed and burnt. This practice, however, is forbidden in some areas because of the fire hazard. Better than paper are the quick-drying plastic films that can be sprayed or brushed on the walls and are easily stripped off. These possess the advantage that they can be applied to the fan or air duct grills without obstructing them.

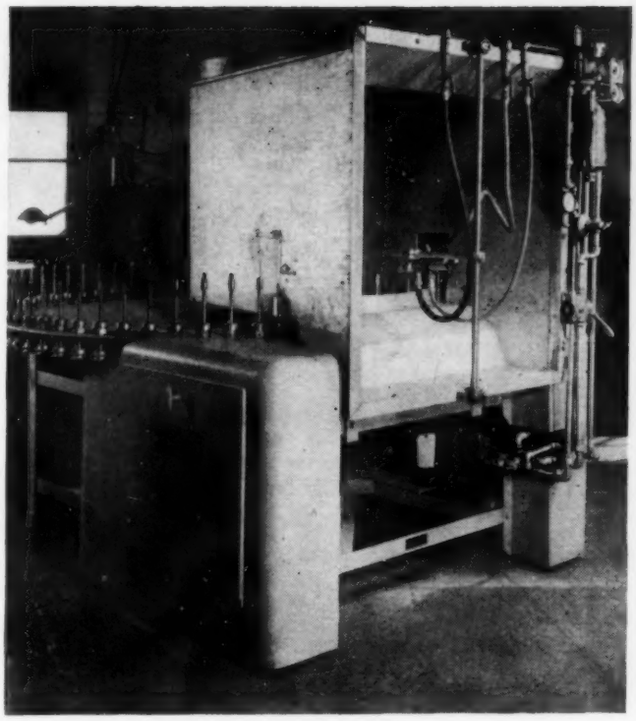
For turntables, paper disks are more suitable, as a fresh disk can be placed over the old one until a considerable pile has accumulated, when the entire stack can be stripped off with a putty knife.

When considerable production is involved, the water-curtain type of booth is preferred. In this, the back wall of the booth is inclined slightly forward at the base, and a continuous stream of water flows over it. The water is collected in a tank inside the booth and recirculated continuously. A powerful exhaust system pulls all fumes and overspray into the water curtain where they are trapped by the water and deposited in the tank. So efficient is this type of booth that it is not necessary for operators to wear any respirator. Tanks should be cleaned out at frequent intervals, and if the operations are on a considerable scale the paint residue may be reclaimed for reprocessing into usable paint.

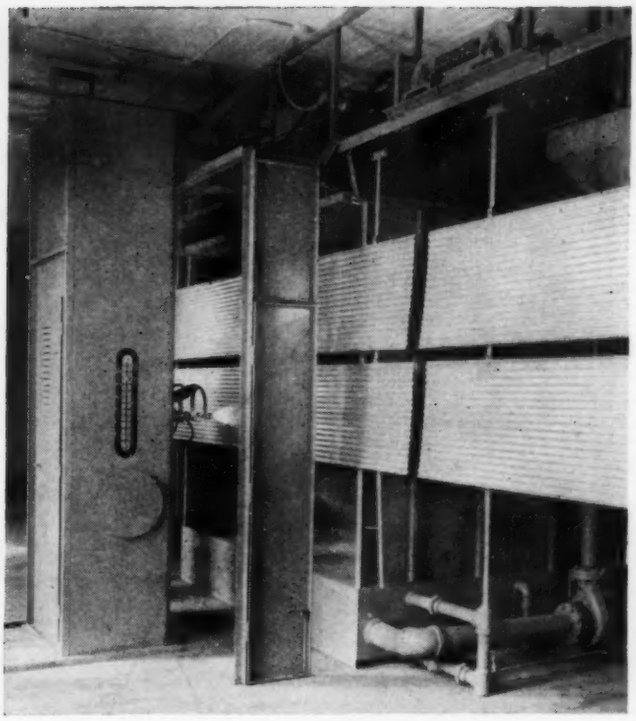
In some types there are several interior water curtains so arranged that the exhaust air is forced to pass over and through them to remove all traces of paint before release to the atmosphere. The water is treated with special compounds that remove all stickiness from the paint and cause the residue in the tanks to form putty-like masses,



Production spraying on a monorail conveyor line in an enclosed booth arranged for downdraft exhaust. Workers should wear masks in this type of operation



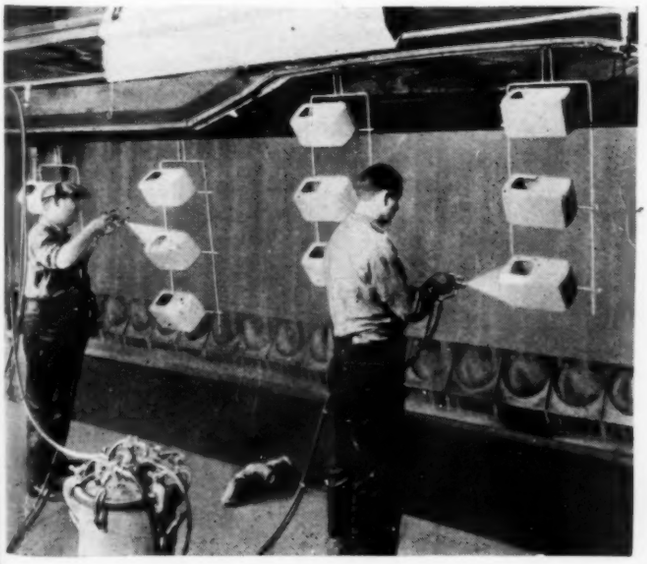
Automatic spray painting machine with rotating table feed. Parts rotate on spindles for coating all sides. Gun is synchronized with table movement to operate only when work is within spray pattern



Flat or corrugated sheets are sprayed automatically as a conveyor carries them past a continuously operating gun. Rise and fall rate of the gun is adjusted to conveyor speed so the entire surface is covered

called sludge, that can be handled without difficulty. If the stickiness is not eliminated it may be drawn into the pump and cause considerable trouble in the circulating system.

The compound may vary with different types of paint, different drying oils, and different percentages of driers, and must be adjusted to suit conditions. However, compounds are available that are suitable for almost any type of paint. If the sludge becomes sticky it is an indication that the wash solution is becoming exhausted, and more compound should be added. If the sludge is powdery, it may be an indication that too much compound is being used and the solution should be checked.



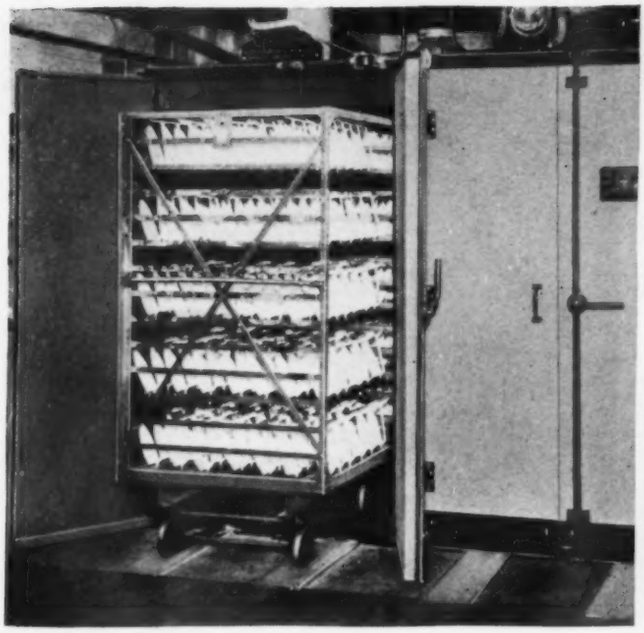
Water wash spray booth for continuous operation on small radio cabinets. Note how work carriers are raised on conveyor to bring lower units within easy reach of operator and eliminate stooping or reaching

Standard size booths are usually available from stock, but for special work they can be built to any desired size and specification, including sizes large enough to accommodate an entire railroad coach. The larger sizes are usually designed in conjunction with a conveyor system, and located adjacent to the cleaning setup and baking ovens.

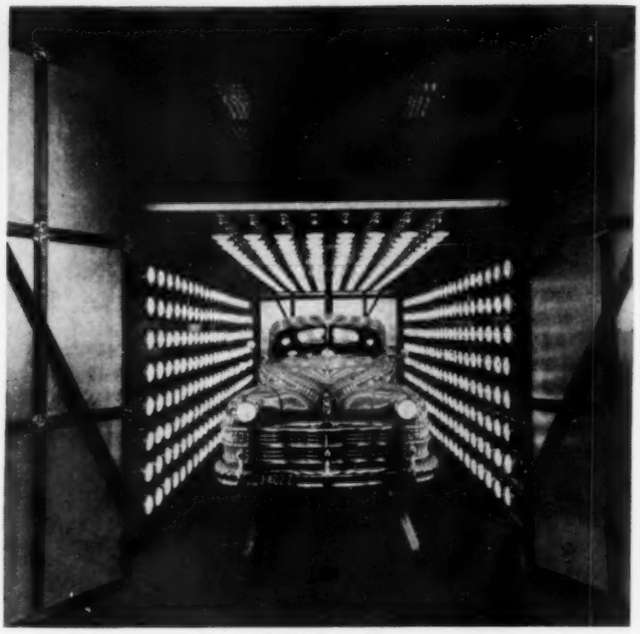
A large continuous system may be arranged to carry parts through a cleaning and Bonderizing cycle; into a booth for primer coating; into an oven for baking; return outside the oven for cooling; into a second booth for the first finish coat; through a baking oven; return to another booth for the final coat; and through the final bake oven. Where baked primers are not used, booths are frequently made sufficiently long to permit the first coat to set up before the work arrives in front of the finish coat station for final spraying.

Where the highest quality finishes are required, booths are completely enclosed and are supplied with clean, filtered air maintained at a slight pressure within the enclosure to prevent any dust from entering and settling on the wet paint.

Many booths are arranged for completely automatic operation, spray guns being set up at different angles to insure complete coverage of all surfaces and actuated mechanically, electrically, pneumatically, or by remote manual control. They may vary from small, single-gun units equipped with an automatic turntable, to multi-gun conveyorized setups.



Batch type, two-compartment oven with indirect gas radiator internal air convection system will provide uniform drying of a compact load of small parts



Repaint job, either partial or complete, is dried in a box-type infrared oven connected through a vestibule to the spray booth, so no dust can settle on the work during its transfer from booth to baking oven

Baking Ovens

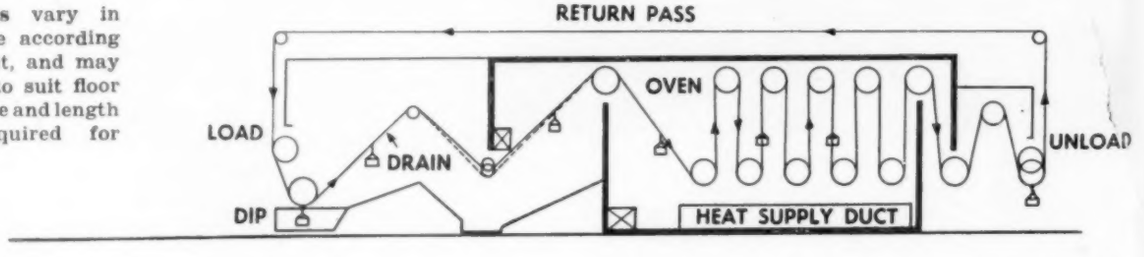
Success or failure of a baked paint job frequently depends to a large extent on the design and manipulation of the baking ovens. Temperatures must be carefully controlled within the limits established by the manufacturer of the particular paint being used, and the time cycles should be carefully observed. In some cases it may be possible to reduce baking time by increasing the temperature, but this is not generally advisable as excessive heat may reduce the gloss and darken light colors. It should be noted that recommended temperatures refer to the heat of the work, not to the actual oven temperature, and an allowance must be made for bringing the work up to heat. When large thick-walled parts are involved, this allowance may be quite large.

Heat, alone, is not sufficient for proper baking; there must be a definite minimum of fresh air circulated through the oven. A foul oven will cause poor drying, and will frequently produce a badly wrinkled surface. Indeed, advantage is taken of this in the baking of wrinkle paints, where a foul oven is a requisite. Soft films, caused by insufficient oxidation; and low gloss, due to trapped solvent, can usually be traced to inadequate ventilation.

Ovens may be of almost any size, and of either the batch or continuous or intermittent conveyor type. Heat may be furnished by steam, oil, gas, or electricity. When gas or oil is used the oven may be either direct or indirect fired, but experience has shown that the indirect type is preferable, especially for finish coats, as the products of combustion may have a tendency to discolor the paint.

In the direct-fired type the burners fire into a combustion chamber located inside or outside the oven, but baffled from the work chamber, so that the heat is removed by circulating fans and introduced uniformly into the work area. In the indirect type the heat from the combustion chamber is passed through a series of radiator tubes, and the heat thus radiated is recirculated through the oven. For reasons of economy the heated air is circulated back to the heater where it picks up additional heat and is reused. With each pass over the work a certain amount is vented to the atmosphere to carry off

Baking ovens vary in style and size according to the product, and may be arranged to suit floor space available and length of time required for baking

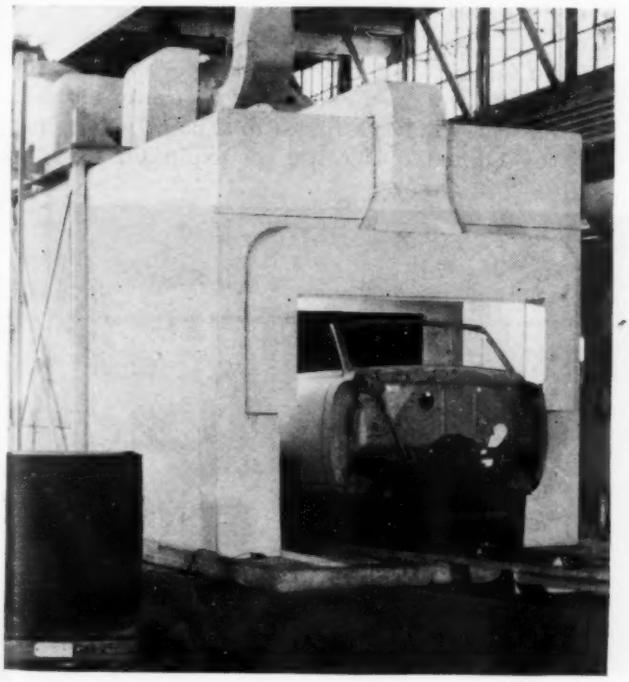


the volatiles, and this is made up by the admission of controlled quantities of fresh air.

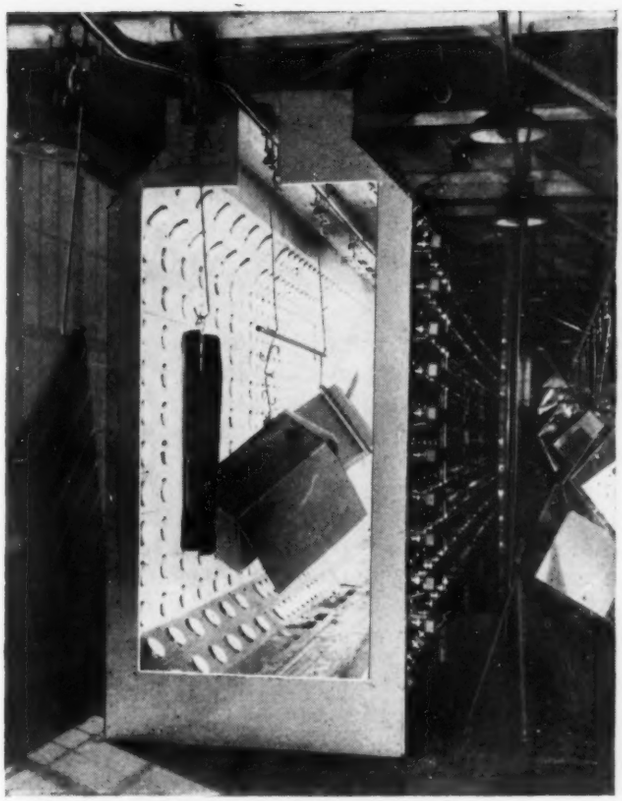
Ovens must be carefully designed to insure adequate circulation and avoid hot spots, and well insulated to prevent loss of heat. Explosion panels should be provided. These usually take the form of loose roof panels or sheets of asbestos that will lift or rip to permit the rapid escape of gases in the event of an explosion. Box-type ovens are commonly equipped with explosion latches on the doors to allow these to blow open with any undue internal pressure. Heat indicators should show the temperature existing at various parts of the oven, and controls should preferably be interlocked.

In the batch type oven the work is introduced into the oven, usually on racks or trays, the doors closed, and the work baked for the predetermined time and temperature. Trays should be of open construction to permit free circulation of air; expanded metal is useful for this purpose as it presents a number of narrow edges on which the work can rest and allows the air to reach all surfaces. For maximum economy ovens should operate at or near maximum capacity, but care must be taken not to overload. Too much work crowded into the oven will interfere seriously with circulation and will produce poor results. When changing from one type of work to another, as, for example, from a small number of large sheet metal parts suspended from hooks, to a large quantity of small castings carried on trays, there will be great differences in the circulation pattern, and controls must be checked and adjusted to obtain even heat distribution.

In conveyor ovens the same design features are applicable as to batch ovens. They are preferred for high production work as they permit a steady flow of work; furthermore, they can be suspended overhead, thus effecting a worthwhile saving of floor space. The shape of the cross-section is such as to accommodate the largest piece of work to be handled, but the length depends entirely on the speed of travel of the conveyor. Usually, the same conveyor is also used to carry the work through the spray booths, and to achieve the necessary time in the oven without delaying the spray operation, a very substantial length of oven is often required. It does not necessarily have to be in a straight line, however, and can be so arranged that the work passes up and down the length, two or three times. When this is done, the oven is commonly divided by walls running lengthwise. A similar effect can also be produced by arranging the conveyor in a series of loops. For continuous work such as wire or screen cloth, the oven can be arranged vertically.



Continuous oven for the production baking of automobile bodies. Work is mounted on four-wheel trucks attached to an endless chain conveyor



Tunnel type infrared baking oven for continuous operation on large marine radio cabinets. Conveyor travels 3 1/3 fpm. and baking time is 16 min.

Radiant Heating

During the past 10 years a new method of heating has come into being, and has already achieved wide acceptance. It consists of using the infrared lamp as a heat source. Heat is instantly available by throwing a switch, and no warming-up period is required. Heat intensity can be varied at will by switching lamps on or off, and there is no fuel consumption when the oven is temporarily idle.

Temperatures at the source of the infrared rays are extremely high, between 3000 and 4000 F., and hence the rate of heat transfer to the work is very rapid. Although the process cannot necessarily be

used on all paint baking jobs, it can, when properly engineered and applied, reduce baking schedules to only a small fraction of the time required by other methods which depend on the combustion of fuel.

In designing an installation for infrared heating it must be remembered that the beam of heat from each lamp has the same shape and characteristics as the visible light beam, and hence, to obtain uniform heat distribution over a surface it is necessary to so arrange the lamps as to give uniform light distribution. If shadows are cast by projections or depressions in the work, the shadowed areas will be shaded from the heat rays, and the lamps must be rearranged to avoid them. Heat is developed at the point where the radiant energy of the lamp is intercepted, that is, at the surface of the work, and the closer the lamps are to the surface, the more efficient will be the heat transfer. However, the shorter this distance, the more localized the heat and the less uniform the distribution. A compromise must therefore be worked out to suit the particular conditions prevailing.

Precautions should be taken to avoid loss of surface heat, and while an enclosure is not essential, protection of the work from drafts can increase efficiency as much as 50%. In an open setup where the work is suspended between two rows of lamps, the transmission of heat from the work to the surrounding air will set up convection currents that can waste an appreciable amount of heat.

In a totally enclosed installation, circulating fans should be installed to prevent stratification of the air and to eliminate the solvent vapors in the same manner as in any other type of oven. Excellent results can be obtained by arranging the oven into separate zones for heating and holding. In the first zone the lamps are closely spaced to concentrate the heat and bring the work quickly to the full baking temperature. In the second zone the lamps are spaced more widely and serve to hold the temperature at the desired level for the time necessary to effect complete baking. In some cases the first zone can be supplemented by a preheating zone in which there are no lamps, but into which hot air is directed from the hot zone. This serves to boil off much of the solvents and shorten the baking time. A similar zone, unheated, at the end of the holding zone can effect some economies by allowing the residual heat of the work to complete the baking process to final hardness.

Before installing infrared heating for paint ovens, it is advisable to consult with the paint manufacturer as to the suitability of his product for drying by this direct, high temperature process.

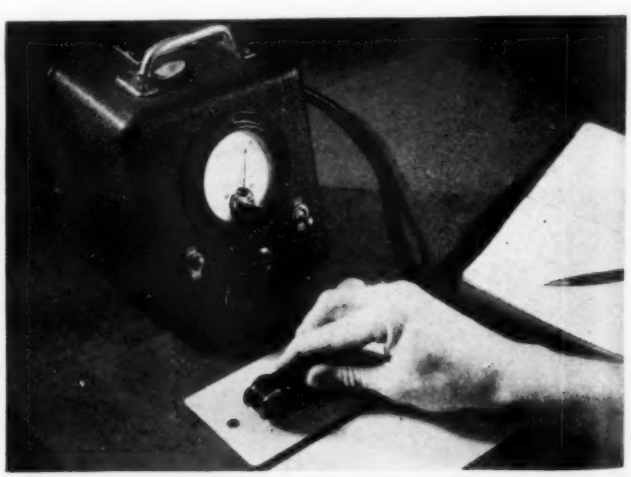
Air Drying

WHEN high speed is not paramount, or the parts are such that they cannot be exposed to the heat of a baking oven, air-drying paints can be used. As their name implies, they will dry by mere exposure to the atmosphere, but the process requires several hours. Most types will set hard enough to be handled in about four hours, but full hardness is not usually obtained in less than two or three days, and as a general rule the hardness never equals that of a baked finish.

For best quality work, drying should take place in a separate room to which fresh filtered air is supplied in sufficient quantities to maintain a slight pressure within the room and eliminate the possibility of dust entering and settling on the work. There must also be adequate exits for the solvent fumes to escape. The drying process may be speeded up by forcing large quantities of warmed air through the room by means of large fans.

If a special drying room is not available, the paint selected should have a minimum drying time, and every possible precaution should be taken to prevent dust from settling on the work. Care must also be taken to see that the parts being dried are not close to any open flames and that natural drafts will not carry solvent fumes to a point where they may be ignited and cause an explosion.

Paint thickness can be checked by measuring the thickness of the work over the paint, and then measuring after a small area has been scraped clean of paint



Electromagnetic gage offers a quick means of checking paint thickness by giving a direct reading on the dial without damaging the finished surface

Inspection and Test

MOST finished work is subject to only visual inspection to check that surfaces are covered completely, have the desired degree of gloss, and are free from runs, soft spots and tears. Experience of the inspector is relied upon for judging whether the color is correct. This is adequate for most work, but it is advisable to make occasional checks to ascertain whether the paint film is being maintained at the required thickness. Too thin a film may result in the surface not standing up to daily wear and tear, and in the case of domestic appliances, to the frequent application of household cleaning compounds. Too thick a film is wasteful of paint, and will usually have poor adhesion to the base metal.

There are several methods of checking the thickness. A micrometer can be used to measure the thickness of the work, and then a second reading taken after the paint has been scraped off. This, however, spoils the workpiece. For accurate, non-destructive measurement there is available the Magne-Gage and the General Electric thickness gage for measuring the thickness of a non-magnetic coating over a magnetic base metal, and the Filmeter for measuring the thickness on non-magnetic base materials. These operate on magnetic principles and can be equipped with dials to give direct thickness readings.

Other tests that may be required include testing for adhesion, hardness, elasticity, and resistance to weather, acids, solvents, fumes, alkalis, soaps and detergents. High adhesion resists the spread of corrosion, allows water to penetrate and leave the film without causing damage, and allows only fine cracks to form when the painted surface is bent. Hardness resists penetration by abrasions, cuts and indentation by blunt objects. Elasticity is the property that allows the film to expand with the under surface without cracking or flaking.

Such tests can be made only in the laboratory under properly controlled conditions, and by means of special apparatus designed for the purpose. The method of conducting these tests does not lie within the scope of this report, but complete information can be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pa., or from the major paint manufacturers.

Visual inspection for paint blemishes takes place on the conveyor line after finished parts have traveled a sufficient distance from the ovens to be cool enough to handle

Safety Precautions

THE greatest hazard in painting operations is that of fire. The Solvents, thinners, vehicles, and sometimes the bases, such as nitro-cellulose, are highly inflammable, and no precautions are too great to avoid their coming into contact with flames or sparks. Solvent fumes are usually heavier than air, when cold, and may spread across the floor over a considerable area if not properly exhausted. When heated the fumes rise and may form an explosive blanket at ceiling height.

Paint rooms should be equipped with a properly designed exhaust system entirely separate from that used for other parts of the plant, and care must be taken that the exhaust is not adjacent to a possible source of ignition. Traps or baffles should be installed to prevent particles of paint from entering the ducts and coating the walls.

Fire extinguishers should be available for instant use, and it should be remembered that water is useless for extinguishing paint fires, as the flaming paint will float on its surface. Fog nozzles, however, and chemical extinguishers are both recommended. Once under way, paint fires can spread with great rapidity, and the intense heat, combined with dense and often poisonous smoke, makes them very difficult to control. Hence, every penny spent on fire prevention should be regarded as a penny well spent. It is not wise to economize on safety.

Points to Remember

Surfaces must be chemically clean and dry.

Thorough rinsing with plenty of clean water is essential.

Avoid touching cleaned work with the bare hands.

When cleaning with solvent, use plenty of clean solvent and a generous supply of wiping cloths.

Wear protective clothing and rubber gloves when using acid or alkali cleaners.

Avoid breathing the fumes from volatile solvents.

Make sure there is adequate ventilation in the cleaning and painting rooms.

Take every possible precaution against fire when volatile solvents are being used and make sure there is no way for fumes to reach open flames.

Aside from the obvious precautions such as forbidding smoking and the use of open lights, it is advisable to see that all electrical equipment is properly grounded, that motors are of the explosion-proof type, lights guarded by gas-tight housings, and frictional surfaces such as moving belts equipped with static eliminators. Solvents used for wiping should be kept in proper safety cans. When considerable quantities of paint are involved, all mixing should be done in a separate, fireproof room with provisions for quick venting in case of an explosion.

In spray painting, the large volume of compressed air intimately mixed with the vaporized paint produces a highly explosive mixture that should be treated with considerable respect. A good exhaust system will handle it with reasonable safety, but the water-curtain type of spray booth offers the best protection. When this is used it eliminates virtually all hazards, and while common sense should still be used, there is actually very little chance of even a small fire occurring.

When open dip tanks are used they should be under a hood connected to an exhaust system, and should be equipped with hinged covers supported by a fusible link so they will drop over the tank in the event of fire. A means of closing manually should also be provided so they can be closed to avoid evaporation when not in use. In arranging dip conveyor systems, attention should be paid to the need for airtight closure. The impossible fire is the one that usually happens, and even quart paint pots have been known to catch fire. A means of smothering small fires, such as a supply of sand or a fire blanket, should therefore be at hand at all times.

Lead poisoning (painter's colic) is still regarded as an occupational hazard, and results from prolonged breathing of paint fumes or from paint taken internally because of improper washing of hands. It can be avoided by the use of suitable respirators. A simple gauze mask is sufficient in most cases, but if the painting must be done in totally enclosed spaces, as in painting the inside of tanks, a breathing apparatus with an air supply is imperative. In concentrated forms, solvent fumes can produce intoxication and may lead to loss of consciousness and in extreme cases, even to death.

Special protective clothing is not ordinarily required, but overalls should be worn while painting. They should be removed when work is finished and hung up in a well-ventilated place. When spattered with paint and solvent they can catch fire easily from a cigarette or other fire, and if left in a heap on the floor may ignite from spontaneous combustion. Again, with a proper booth and exhaust system the use of respirators and the fire hazard of clothing can be largely eliminated.

Solvents have a drying effect on the skin, and this, and also some paints, may result in skin eruptions. Except where there is a definite allergy, thorough washing with a good neutral soap will usually prevent dermatitis. Hand creams to be rubbed into the skin before starting work are also available and form a good protective coating. They can be washed off with soap and water and will carry all foreign matter away with them.

Ordinary common sense and an understanding on the part of the worker that he is handling potentially explosive material will do much toward preventing accidents, and with reasonable care painting need be no more dangerous than any other occupation.

We Acknowledge . .

. . the very generous cooperation of the following companies in furnishing the information that made possible the preparation of this report:

American Chemical Paint Co.
The Arco Co.
Binks Mfg. Co.
Despatch Oven Co.
Detrex Corp.
DeVilbiss Co.
Devoe and Raynolds Co., Inc.
E. I. du Pont de Nemours & Co.
Eclipse Air Brush Co., Inc.
Frigidaire Div., General Motors Corp.
Gehnrich Oven Div., W. S. Rockwell Co.
General Electric Co.
Glidden Co.
Grand Rapids Varnish Corp.
C. M. Hall Lamp Co.
Hanlon & Goodman Co.
Hilo Varnish Corp.
Kaiser-Frazer Corp.
Lowe Bros. Co.
R C. Mahon Co.
Osborn Mfg. Co.
Parker Rust Proof Co.
Pittsburgh Plate Glass Co.
Ransburg Electro-Coating Corp.
Rubberset Co.
Sherwin-Williams Co.
Sperry Gyroscope Co.
Westinghouse Electric Corp.
Wooster Brush Co.

NO ONE LIFTS MORE THAN 10 LB.

Carefully installed jib cranes cut down sources of fatigue and injury and increase production

BY D. A. JOHNSON
Plant Engineering Dept., Ashtabula Plant
RELIANCE ELECTRIC & ENGINEERING COMPANY

THROUGHOUT our new plant we have installed 69 jib cranes of ⅛- and ½-ton capacities. These cranes are so placed that no operator need do heavy lifting and take the chance of ruptures or crushed toes. In addition, these jib cranes are really part of a materials-handling system designed to increase production and make the plant a good place to work.

The ½-ton jib cranes are of our own design. Two types are required: one for situations where there is ample headroom, the other to clear low-hung light fixtures, sprinkler heads or other equipment suspended from the ceiling. Both types travel a full 360°, but are constrained by stops not to overtravel in order to avoid tangling the power cords.

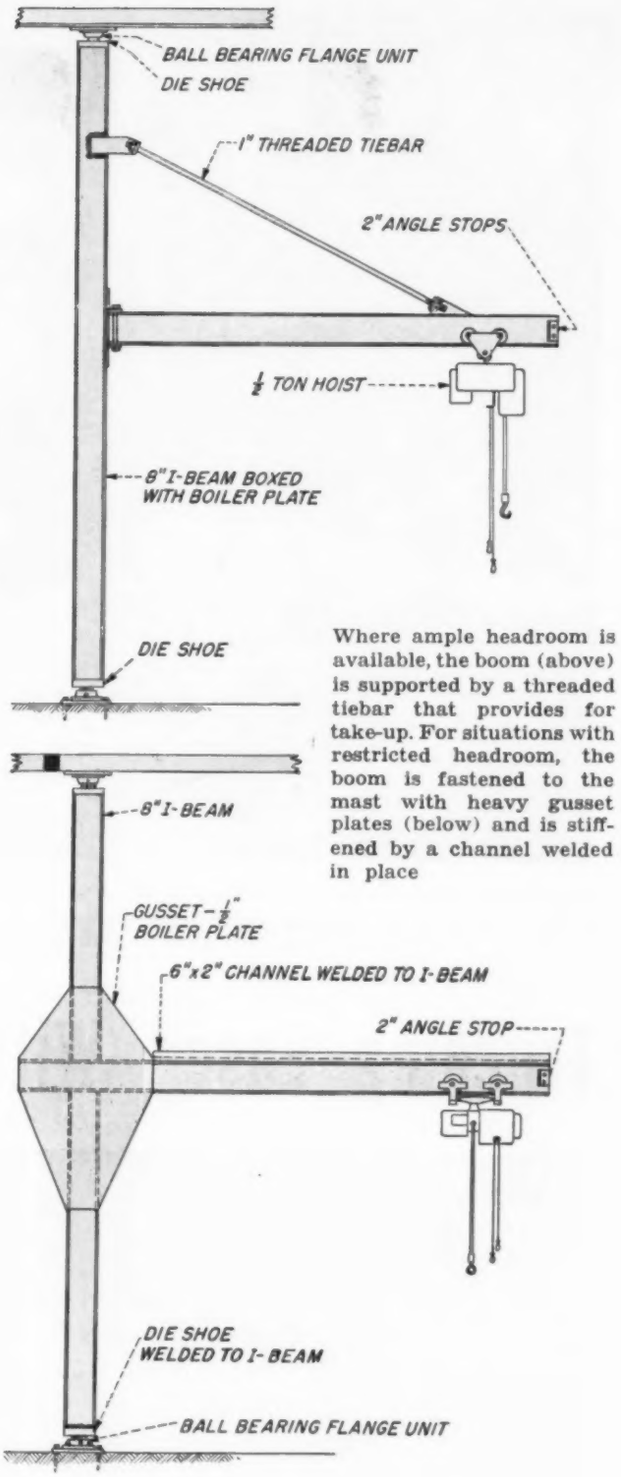
For effortless travel or swinging of the boom, both types of ½-ton jib cranes are mounted in ball-bearing flange units. To accomplish this, die shoes are welded to both ends of the mast. Next, the die shoes are inserted in the ball-bearing flange unit, one of which is lagged through the wood-block flooring into concrete and the other welded to the trusswork.

In erecting these cranes, extreme caution is used to align the mast. If the mast is out of plumb, the boom will swing on the freely moving bearings to the low point, causing trouble to the operator and possible equipment damage.

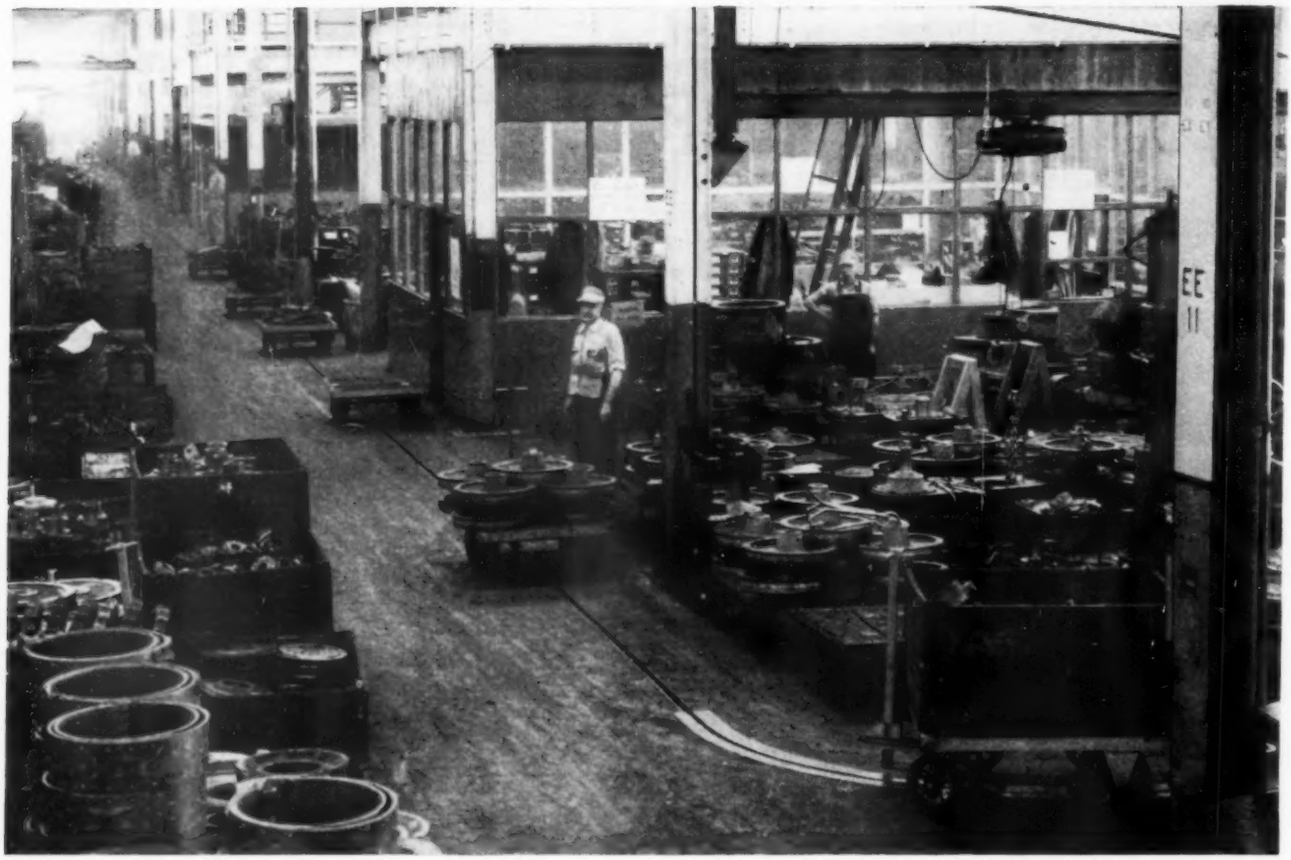
Standard ½-ton hoists are used, geared to suit the operation. Power to operate the hoist, in each instance, is provided by an electrical outlet directly above the mast. Self-coiling cords are supplied to prevent draping and entanglement. And since stops prevent the boom swinging past 360°, the cords can not be wound around the mast to rupture the power line or receptacle.

The ⅛-ton jib cranes are of standard make with a permanently mounted mast lagged to floor and welded to trusswork. A triangular boom with 11-ft. reach operates in bearing blocks fastened to the mast. The bearing blocks have ball-bearing inserts, and are fastened in a manner such that the boom is adjustable for height. Travel of the boom is 270°. Standard hoists are attached by rollers straddling the boom. This arrangement permits the hoist to be moved to any position on the boom.

The ⅛-ton hoists are geared to give speeds from 11 to 34 fpm., depending on the type of work for which they are used. For example, if a heavy part is to be inserted in another part, a slower-speed hoist is needed to guide the inserted part into place. Load capacity is changed by the gearing arrangement.



Where ample headroom is available, the boom (above) is supported by a threaded tiebar that provides for take-up. For situations with restricted headroom, the boom is fastened to the mast with heavy gusset plates (below) and is stiffened by a channel welded in place



Drag-chain conveyor moves special wagons to and from the miscellaneous machining section. Chain travels continuously at 10 fpm. and wagons can be engaged or disengaged without danger. Track is set in wood-block floor so trucks can move across chain without interference. Box sides of lift-truck skid platforms also fit conveyor wagons

Trucking Eased With Drag-Chain Conveyors

Beginning of trip along conveyor occurs when the end of the draw-bar is dropped into the passing chain link. Wagons are loaded at machine shop inspection and are pulled to the chain

Ending of trip occurs when wagons are disengaged from the chain in the stockrooms and are pulled into aisles alongside storage bins. After unloading, empty wagons are attached to the chain for movement back to the machining departments

Four systems serve production departments as well as warehousing and shipping at Allis-Chalmers. Widely separated buildings are tied together

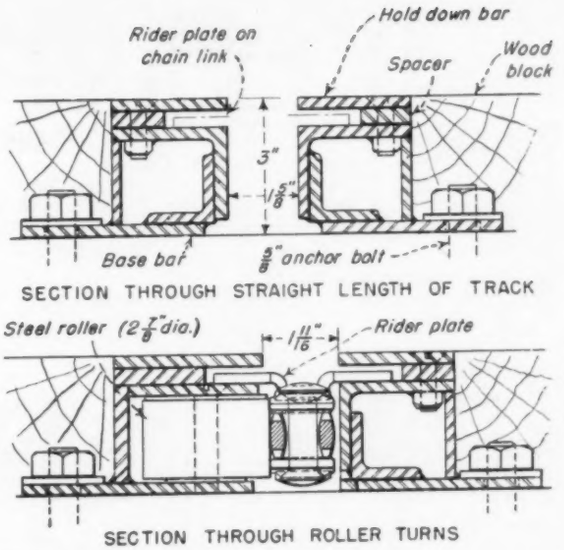
BY BEN C. BROSHEER, ASSOCIATE EDITOR

FOUR unusual drag chain conveyors have been installed in the Springfield Works of Allis-Chalmers Manufacturing Company's Tractor Division for moving 3x4-ft. wagons along the shop aisles. Specially designed for use with these conveyor systems, the wagons have novel drawbars that can be dropped into the chain links of the conveyors, or moved forward so the wagon can be drawn by hand as any standard four-wheel shop truck. Normally, these wagons are used only on the conveyor lines, either for delivering parts to machining departments or for delivering finished parts from these departments to the stockrooms.

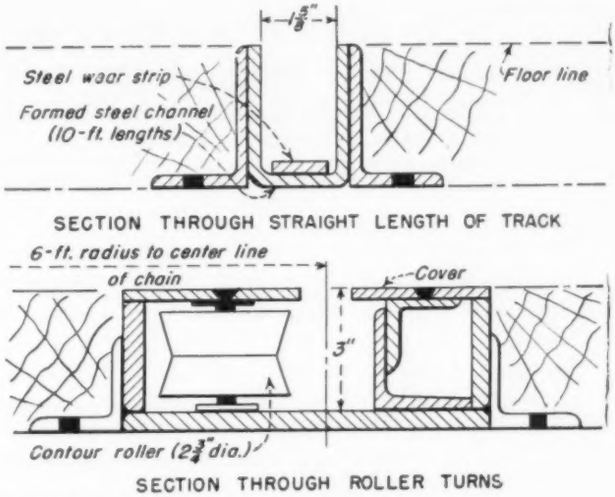
In each of these conveyor systems, the drag chain is sunk in the floor with special 6-ft. radius right-angle turns and 180° takeups and with chain drive units mounted in pits below the floor level.

The first of these systems to be installed has a 1726-ft. long chain, with ten right-angle turns, one takeup unit and three 3,000-lb. capacity drive units. It serves the service-parts warehouse and shipping departments. This conveyor operates in two buildings, passing through a covered runway with sufficient clearance between chain lines so trucks being drawn along both sides will clear each other.

During the recently completed modernization program, particular attention was given to the solution of materials-handling problems in the Springfield Works. Because of the excellent results obtained with the original drag-chain conveyor, it was decided to install three similar systems in the machining departments. One of these, with a 1460-ft. long chain, six right-angle turns, one takeup unit and two drives, serves the miscellaneous machining and welding departments, delivering finished parts to a nearby stockroom. A shorter system, with 750

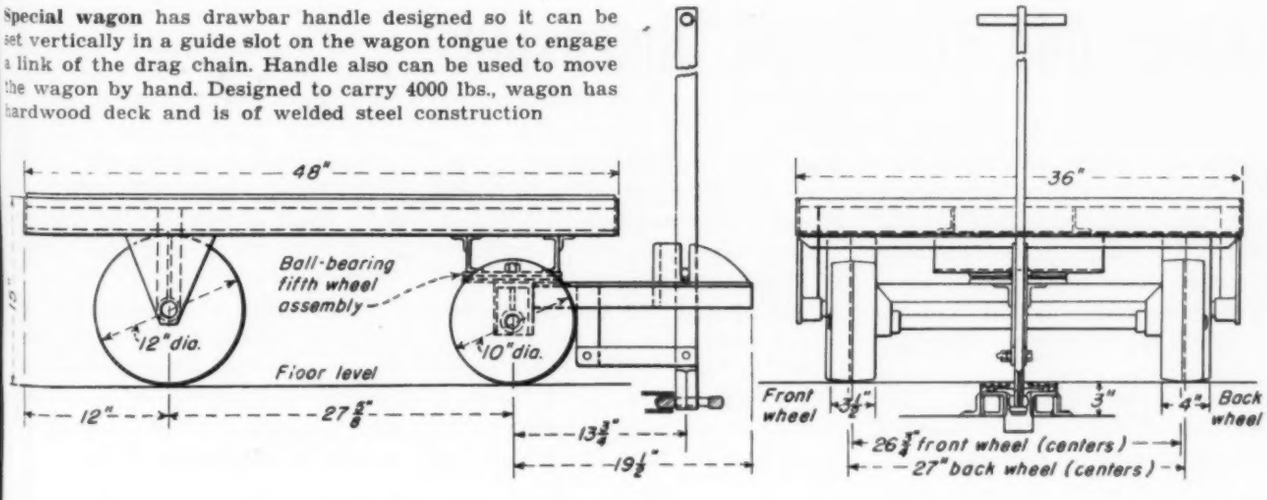


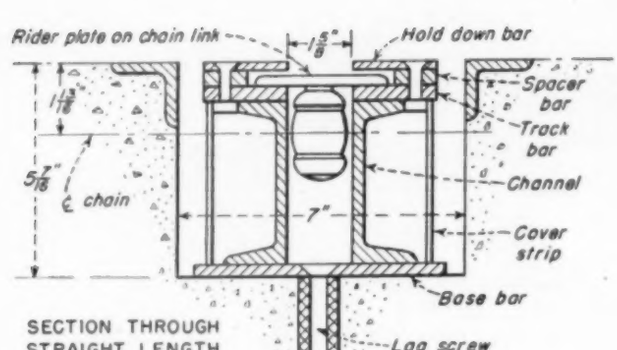
Original chain trough fits into standard 3-in. wood-block floor. Chain was equipped with heat-treated rider plates because it was thought chain might ride up out of slot when pulling heavily loaded wagons

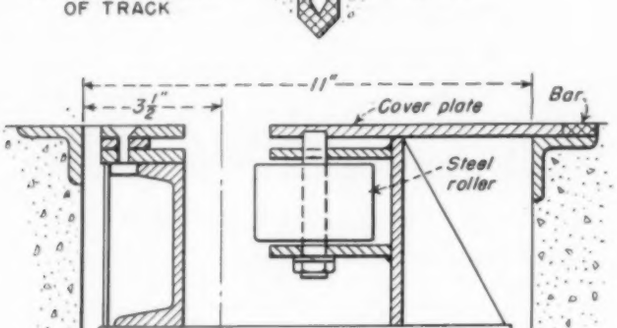


Simplified trough resulted after experience with the original system proved rider plates unnecessary when the entire length of chain moved horizontally. Rollers at the turns are contoured to resist any tendency of the chain to rise out of the channel

Special wagon has drawbar handle designed so it can be set vertically in a guide slot on the wagon tongue to engage a link of the drag chain. Handle also can be used to move the wagon by hand. Designed to carry 4000 lbs., wagon has hardwood deck and is of welded steel construction







Heavy-duty trough is set in a channel in a concrete floor. The chain serves two buildings through a tunnel, and heat-treated rider plates are necessary to keep the chain in the track on inclines leading to and from the tunnel

ft. of chain, one drive unit, one takeup unit, six right-angle turns and two 45° turns, serves the gear-cutting and finishing department in a separate building.

The longest system, most recently put into operation, has 1946 ft. of chain, three drives, one takeup unit, 12 right-angle turns and two 45° turns. This system operates between two widely separated buildings, passing through a 405-ft. long tunnel whose floor is 13 ft. below the floor level of the two buildings. At both ends, the tunnel floor is inclined at a 17° 44′ angle, with the inclined chain runways meeting the level runways along radii 40 ft. long. Chain runways in the tunnel floor are spaced 5 ft. apart so passing wagons will clear with ample room for workers using the tunnel for passage between the buildings.

In each of the four conveyor systems, chain speed is 10 fpm. and all right-angle and 45° turns are designed with a 6-ft. radius to the center of the chain. In each system, rivetless conveyor chain is used. This chain has a 4-in. pitch, is 2¼ in. wide and 1⅜ in. high, and uses ⅝-in. dia. pins. It weighs 3.1 lb. per ft. and has an ultimate strength of 48,000 psi. in the heat-treated condition. Details of the chain troughs are shown in accompanying sketches. While chain troughs vary in design between the systems, all are arranged so the same standard wagons can be used.

Within the various machining departments, standard 3x4-ft. lift-truck skid platforms, with or without box sides, move parts from machine to machine. Lift trucks deliver these skids to inspection benches where the parts are checked prior to delivery to stock-rooms. Here, parts approved by the inspectors are transferred to the conveyor wagons, which are so designed that skid box sides also will fit their decks. Thus, as a skid is emptied, its box sides can be transferred to a waiting wagon.

When a wagon has been loaded, it is drawn by hand to the conveyor line and its handle is set vertically so it can be dropped into the runway for engagement with a passing chain link. The moving chain then takes the wagon, without further attention from anyone, to the stockroom where the wagon is disengaged from the chain and drawn into a bin aisle for unloading. Empty wagons are returned to the machine shop by the same conveyor line.

Adding Odd Fractional Dimensions

MACHINISTS and engineers who deal with linear dimensions must frequently calculate half of a given dimension, often including a fraction. This is a problem when the whole number is odd, and especially if the fractional numerator is also odd.

Short of writing down the numbers and calculating the quotient the long way, or converting the dimensions to decimals, here are some mental gymnastics that will eliminate the problem in a hurry:

For example, find half of 17 19/32. . . . .

Add 19 and 32, the numerator and denominator of the fraction, giving 51. Half of the whole number is obviously 8 and a fraction, and the final denominator must obviously be 64. Therefore, the correct answer is 8 51/64.

In a like manner, half of 23 13/16 is 11 (half of 22) and 13 plus 16, or 29, over 32. The answer here is 11 29/32.

In 32 years of engineering experience, I have found only a few people who used this method, although I have explained it to many who have adopted it. *John Kaashoek, Grand Rapids, Mich.*

ROUND TABLE

Present—or Bribe?

"Ed, I don't know whether to be happy about this or not."

"What's the matter, Al? The good wife present you with quadruplets?"

"No, nothing as simple as that. I could handle the kids all right, but I'm not certain about this. The boys clubbed together and presented me with this swell wrist watch."

"Well, what're you worrying about?" frowned Ed. "You should be dang glad to think that you are so well thought of by the men."

"Oh, I don't know about that," said Al. "Seems to leave me wide open."

"How do you mean, Al?" puzzled Ed.

"Well, it's hard to say. I just wish the boys hadn't done it, that's all. Why the heck does a fellow have to have birthdays anyhow?"

"Then, just because the boys showed they like you, you feel you are on the spot, eh?" laughed Ed. "Feel like a man with his hands tied, as it were—check?"

"How else can I think about it? Of course I appreciate the thoughtfulness of the boys, Ed, but, as I said before, I'd feel much better if they hadn't done it."

"You're too darned sensitive, Al; just thank your lucky stars that the boys think so much of you—just think, my friend, every time you look at that little timepiece you have a warm feeling for the boys."

"Yeah! Something will be coming up one of these days when I'll have to do my duty as the boss, and how can I be honest and fair with a gift watch staring me in the face?"

"You should accept the watch in good faith—with a feeling that the boys presented it with no strings attached. See this, Al; the boys gave this to me many years ago and I'm telling you I have never had anything give me such a good feeling every time I look at it."

"Yes, you told me the story some time back," said Al. "You must recognize the difference though, Ed; yours was a parting gift, but mine is a millstone around my neck while I'm still on the job around here. I claim that the boys should have thought this thing through before doing it—darn it, Ed, there's always some pusher who instigates these things and, of course, the other fellows follow along regardless of their opinion. I know it isn't much when the expense is divided up, but there are some who really can't afford to keep dishing up."

"I still think you're making a mountain out of a mole hill—forget it, Al, and enjoy the timepiece."

"Sez you! Every time I look at it the time will be twenty-five after one—and the one is me!"

***WHY IS THE OLD CUSTOM** of a present to the boss dying out? Were too many of them not free-will gifts, but bribes? How about the man who can't—or won't—contribute; hasn't he the right on his side? Your opinions and ideas on this subject will be appreciated by others. Discussions of earlier topics appear on later pages.*

Small Chip-Handling

SERVES TWENTY-TWO

←**Automatic-cycle elevator** has chain-driven carrier that raises tub-load of centrifuged chips along a track so curved that tub is tilted at the proper level and dumps the chips into a chute leading to an outdoor storage bin. Operator presses a pushbutton to start upward motion of the carrier. At the dumping point, carrier operates a limit switch to reverse travel of the chains and return empty tub to loading position, where another limit switch is actuated to stop the elevator. Carrier has two hand-operated clamps to hold tub during dumping

Special carts developed for gathering chips from the single-spindle automatics hold two standard centrifuge tubs into which the chips are dumped. This eliminates rehandling chips when the carts are returned to the salvage room because the tubs are transferred directly from the cart to the centrifuge. A hinged frame is lowered over each tub to catch shoveled chips. After centrifuging, chips are moved in the tubs to the elevator

Department AUTOMATICS

BY R. E. WHINREY
Superintendent, Dodge Plant
Ball & Roller Bearing Division
LINK-BELT COMPANY

Three-wheel carts have been developed to fit under the discharge end of the chip conveyor on each of the multiple-spindle automatics. Each cart holds a tub-load of chips, and when filled, is wheeled to the salvage room where its load is shoveled directly into a centrifuge tub

SPECIAL handling equipment and an oil reclaiming system feature the small chip-handling department recently installed in the Dodge Plant, Link-Belt Company. The department consists of a Barrett 425-lb. capacity centrifuge, a National Acme oil clarifier, oil storage tanks and pumps, and an automatic chip-basket elevator. This equipment serves the 12 multiple-spindle and 10 single-spindle automatic screw machines used in the machining of races and rolls for Link-Belt bearings.

Features of the department that reduce handling include the two specially-designed chip-handling carts and the automatic elevator illustrated here.

Another feature, which is helping to pay for the installation, is the reclaiming of cutting oil from the chips. At present, reclaimed oil is delivered from the clarifier into a clean-oil storage tank under the floor in the salvage room. From here it is pumped to tank trucks for transfer back to the screw machines. When the department is completed, pipe lines will deliver oil directly from the storage tank to the individual machines. Valves will be provided at each machine so the operator can draw oil as needed.

A storage bin into which the centrifuged chips are chuted from the automatic elevator is located on a truck dock outside the screw machine building. Periodically, a local scrap-metal dealer sends trucks and men to remove the chips from the bin.

With the shop working its present 16-hr. day, 5-day week schedule, up to 30,000 lbs. of chips are handled by the department each week.

Criteria for Decentralizing Industrial Organization

SPEAKING at the 25th General Management Conference of the American Management Association, Lounsberry Fish, organization counsel (Standard Oil Co. of Calif.), pointed out that "one of the great needs and present trends in industrial organization is toward decentralization."

Developing this theme, Mr. Fish presented the following "criteria which should guide the division and subdivision of the total undertaking into component responsibilities" and "which will permit management to delegate and decentralize its burdens without sacrificing essential coordination and control."

"Whether these components represent departments, divisions, subsidiaries, branches, sections, committees, staff agencies or executive offices, each should measure up to the following general qualifications if the organization is to click:

"Each should be centered and organized around the achievement of a major management purpose—whether it be performing a necessary function, conducting a successful subenterprise, providing needed coordination between related activities, or making sure that an important aspect of the mangement job is well done throughout the enterprise.

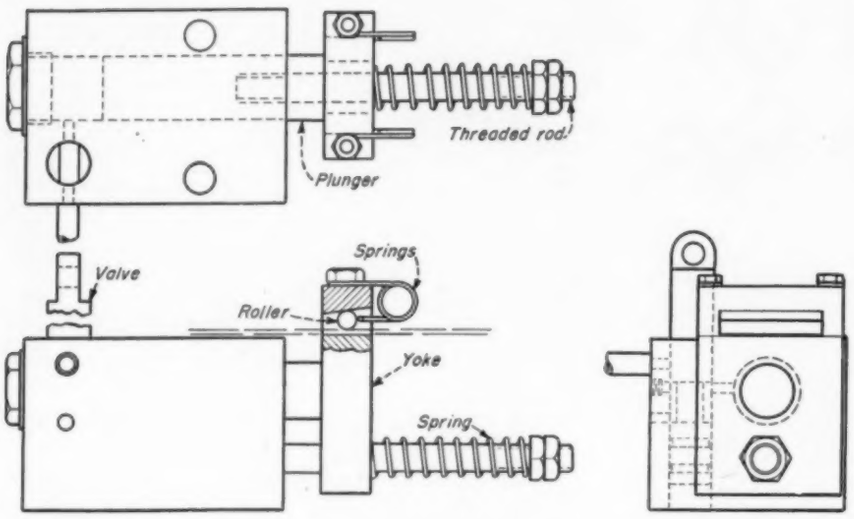
"Each should comprise a logical separable field of responsibility—a natural subdivision of the total undertaking, whose scope and jurisdiction can be clearly defined.

"Each should represent a clear-cut contract — definite as to scope, purposes, objectives and results to be achieved—for which a single, properly qualified executive, supervisor or staff man can be held squarely responsible and accountable.

"Each should contain all elements which are parts of a closely related group, which "belong" together, which comprise a complete entity.

"Finally, each should have easy, workable relationships with other associated elements, with a natural . . . . cleavage between them."

Practical Ideas



Roller-Grip Pneumatic Attachment Feeds Strip Stock to Punch Press

A press feeder that has been operating in our shop for over a year has helped produce a million parts without needing replacement or repair. The pneumatically-powered unit feeds coiled strip stock to a punch press.

Strip is fed forward by a plunger working in a honed hole in the block base of the device. A shuttle valve operates in a vertical hole in the block—held in top or bottom position by a spring-loaded ball (not shown). A threaded rod passes through a lug on the press ram and actuates the valve. Length of valve stroke is controlled by jam nuts on the threaded rod.

A rod press-fitted into the block carries a coil spring and two adjusting nuts that position the stroke of the plunger—hence control the length of stock fed in one stroke. The spring returns the plunger to rest position when the air cylinder is exhausted. Velocity of the stroke is adjusted with a needle valve in the air-supply line, and lubrication of the piston is handled by an air-line lubricator.

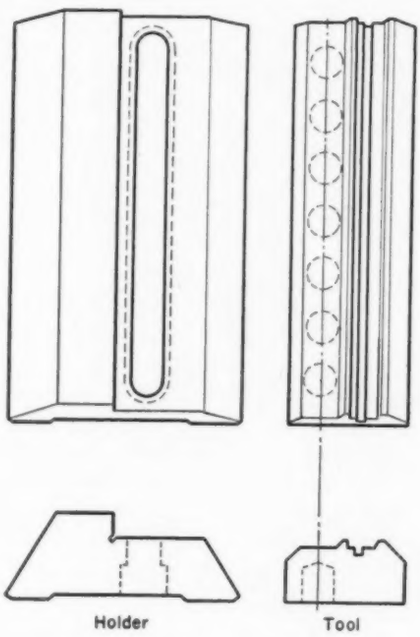
Riding in a yoke on top of the block, a hardened-steel roller grips the stock when the plunger moves forward. This is made automatic by two spring-steel coils on the yoke that force the roller to the small end of the slot. On the reverse stroke the stock is held by the punch and the roller rides to the wider end of the slot as it rolls back into position for a new grip.

The holes in the unit were honed and critical diameters and faces were ground and polished. No packing was required and no leaks have developed. The complete device was made, set up and adjusted within a short period of time. Two holes were drilled in the block for attachment to the press. *S. H. Pearson, Glasgow, Scotland.*

Two-Part Flat Forming Tool Made and Sharpened Quicker

Flat, dovetail forming tools for an automatic lathe are normally made in one piece and reground completely to present a new edge to the work. This operation can be considerably simplified and shortened by making the form tool in two parts—a holder and a bit.

The holder is machined and ground to the regular shape, but a recess is left for the bit. A longitudinal slot in the holder is cut to take the heads of bolts that would drive into drilled and tapped blind holes in the tool itself. These holes are drilled into the tool at close intervals.

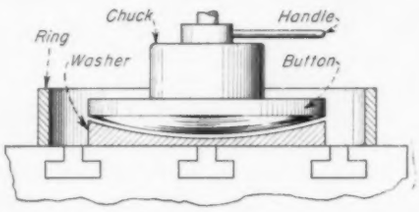


With this method, rough forming time was cut from five hours to two, and grinding time was cut to a third. Sharpening time, too, was sharply reduced. The critical dimensions—from the tool holes to the side of the tool, and from the side to the form itself—were held close enough during grinding to prevent trouble in lining up the tool after a resharpening job. The tool was made from Rex 95 HSS.

An added advantage is that only a limited number of holders, if they are made identical, are needed for setting up many different forming tools. *Stephen E. Hancock, Oakland, Calif.*

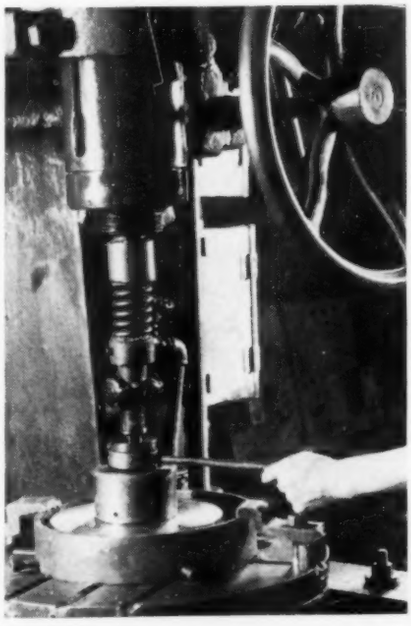
Rotating Drillpress Table Speeds Lapping Operation

Hand-lapping time on step washers and wearing plates (buttons) for crusher mechanisms has been cut by 35 hours by a lapping device built into a drillpress.



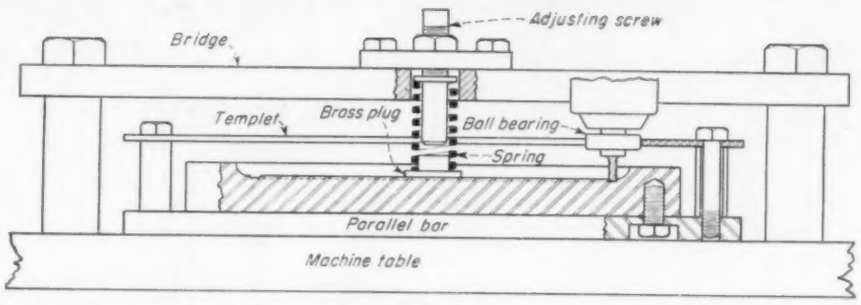
BUTTON is chucked on drillpress spindle to rotate in opposite direction against washer

A large steel ring, clamped to the drillpress turntable, holds the steel washer within bounds as it rotates. A spring on the drillpress spindle allows universal action of button on washer as the surfaces grind together.



ECCENTRIC MOTION is started by worker as he moves spinning button around on washer

Once started by hand, the action takes only 3½ hours to complete the lapping operation. The eccentric motion between washer and button makes the lapping uniform. *Harold Greuel, Allis-Chalmers Mfg. Co.*



Milling Setup Slips Under Spring To Help Cutter Around Die Corner

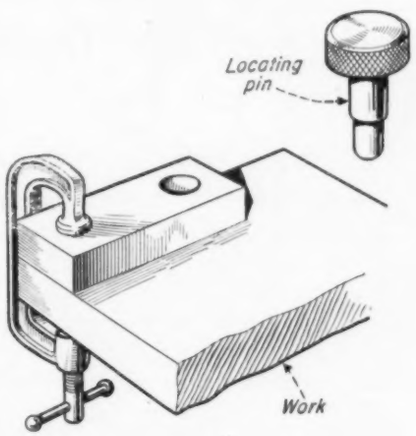
Our shop had to do a die-sinking job on a mold. The recess or slot was to be 1/32 in. deep and ⅛ in. wide, and followed the rounded rectangular outline of the mold at the base of a radius in the face of the mold.

A templet was cut to the outline of the recess, but larger than the recess all around by the amount of radius of an available ball bearing. The bearing was mounted on the shank of the ⅛-in. cutter on a universal milling machine's vertical head. This rode inside the templet outline to guide the cutter.

Parallel bars were bolted to the under side of the mold through existing tapped holes and the templet was mounted on top of the mold, spaced up the correct distance so the cutter would contact the work when the bearing was level with the templet. A large bridge was mounted on the machine table to hold an adjustable spring tipped with a brass plug.

The function of the spring was to hold the mold, templet and bars solid on the table during a straight cut, but to allow the assembly to turn when the cutter came to the end of the straight portion of the outline. At the corners the templet moved enough on the table to allow the cutter to travel about half way around the curve while still traveling under traversing feed. The other half of each corner was cut by engaging the feed at right angles and coming around the curve from the other direction.

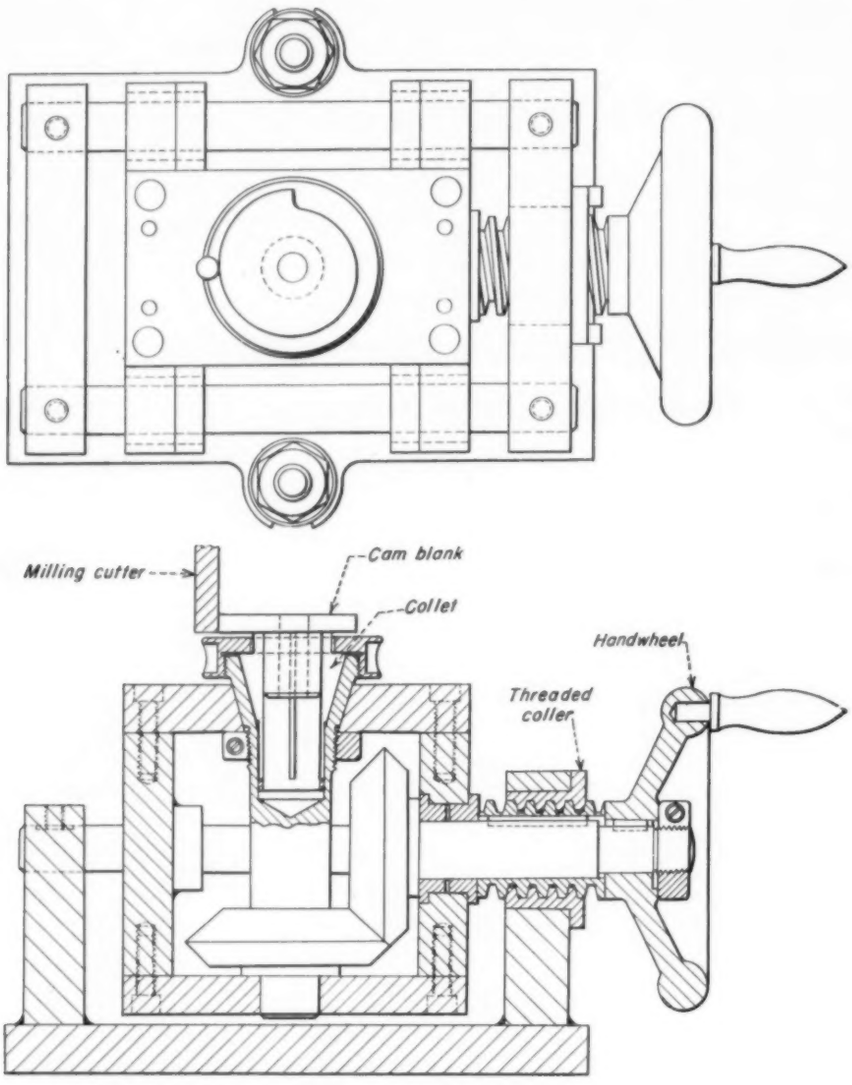
Although most die-sinking with a vertical mill is done by clamping the work and operating two feeds to get around curves, this system is fast and mistakes are less easily made when one feed alone is used at a time. The cutting load must be light, as in this case, for the method to be employed with accuracy. *D. Moore, Richmond, Australia.*



Tap Locater Halts Breakage

Consistently good tapping results and a minimum of broken taps can be maintained by clamping an aligning block to the work after the hole has been drilled. The block keeps the tap lined up and prevents wandering. It is positioned by a locating pin.

Although the illustration shows only one hole, any number can be drilled in the same block. After drilling, the block is hardened. The locating pin, topped by a knurled knob, is ground with its larger diameter the same as the tap O. D.; its smaller one just under the drill diameter. The hole in the block is slightly larger than the tap O. D. *Charles Muscato, Chicago, Ill.*



Geared Disk-Cam Holder Matches Feed and Rotation for Milling

Constant-lead disk cams are commonly generated in a milling machine fitted with a dividing head. The same type of cam can be produced on a plain vertical milling machine without a dividing head but with a special fixture that rotates the cam and advances it into the cutter at the same time.

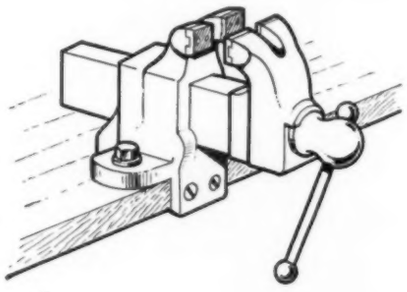
A pair of bevel gears and a screw combine to give the necessary motions to the cam blank. The fixture is locked to the milling table by bolts through its base. Two horizontal round bars carry the movable frame of the mechanism and allow it to move back and forth. As the handwheel is revolved, the threaded shaft turns with the handle and bears against the surfaces of the fixed nut. The nut is secured to the fixture base, but may be replaced for different jobs.

The cam blank, supported by a short shaft, is clamped in a collet in the top of the fixture. This collet, in turn, is fixed to a shaft rotating in the moving frame which also carries a beveled gear. The handwheel shaft is keyed to a second beveled gear, which meshes with that on the collet shaft.

Since the threaded collar is keyed to the handwheel shaft, one revolution advances the frame and the cam the lead of the screw. This is set up as the total amount of rise for the cam. During the rotation the bevel gears revolve the cam one revolution, which completes the cycle of the milling job.

For the original job the fixture was set up so the handwheel overhung the edge of the machine. Three cuts completed the work. With a given threaded-collar and nut combination, only one depth of rise can be cut, but different setups can be easily made by replacing these two components.

The fixture is made of steel, with bronze bushings and nuts, and the slide bars are hardened. Practically any reasonable size of beveled gears may be used, but they should be lapped in to provide smooth running, which insures smooth surfacing on the cam edge. The mechanism should be tight to prevent backlash. *Clifford T. Bower, Decatur, Georgia.*

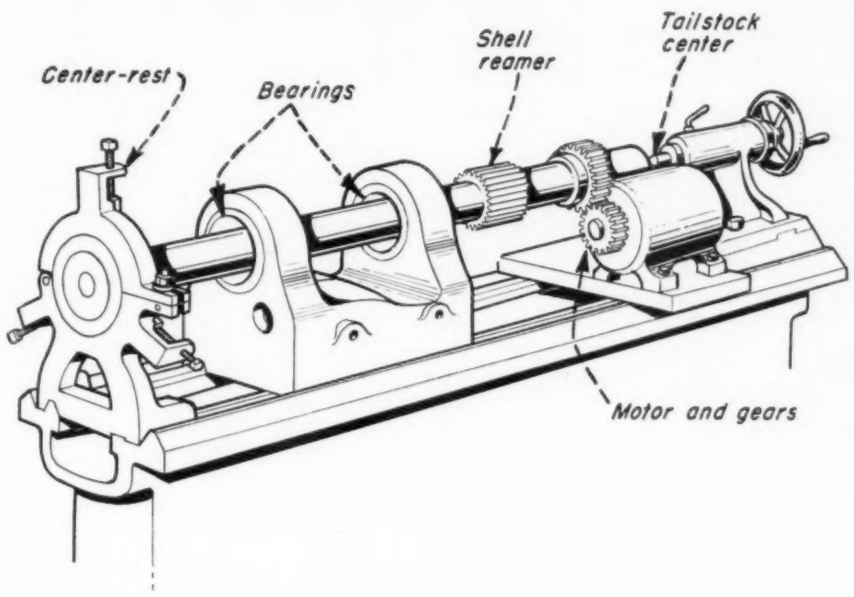


Cut-Out Bench Vise Clamps Round Stock and Weld Work

After a minor change in a standard, 4-in. machinist's vise, we found that the design could be utilized for many usually difficult shop jobs. The vise was cut out down the center and four hardened-steel jaw plates were fastened to the jaws by recessed capscrews.

The vise was originally changed to handle round work in a vertical position, which it does very well. Parts to be butt-welded can be clamped in the vise and processed with no interference of the vise jaws. Soldering is also simplified.

In addition, work that is clamped in the vise can be drilled, sawed and filed more completely. The cut-out allows getting at the side of the work where previously only the top and ends could be worked on. *Charles H. Willey, Penacook, N.H.*



Headstock Bearings in Old Lathe Replaced in Shell-Reaming Setup

Practically all components of an old-time lathe except the critical headstock bearings can become badly worn without seriously affecting the accuracy or capacity of the machine. But the cap or split bearings in the headstock—in conjunction with the tailstock center—directly control the performance of the machine. Unlike other lathe parts, the amount of take-up for wear is limited, and split bearings become out of round and practically useless. However, these bearings can be replaced to put the lathe back into accurate service for many extra years of work.

All parts of the headstock are removed and the housing is taken off of the ways. The spindle is cleaned up and ground, if necessary, to remove scratches and gouges. A shell-reamer size is selected to correspond to the spindle diameter, and this may make regrinding the spindle down to a standard reamer size necessary.

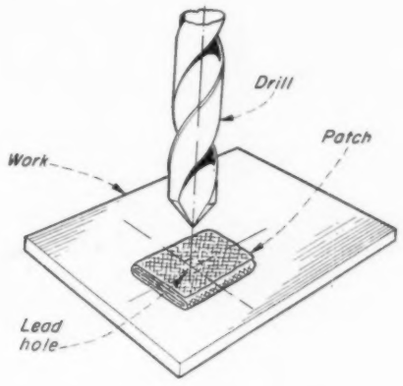
A solid brass bushing is turned when new split bearings of brass are made. These parts should not be machined on the old lathe because of the inaccuracy in the machine. The solid bushing is drilled and reamed to the diameter of the arbor to be used with the shell reamer. It is then set in the lathe center-rest and can be located exactly by moving the rest to the tailstock and indicating the bushing hole from the center.

After the rest is removed from the lathe, the headstock housing is set in position shown in the illustration and the rest is replaced at the head end of the ways. With the bearings held in place by countersunk screws, the shell reamer and arbor are mounted between the tailstock center and the bushing in the rest. A spur gear is keyed to the arbor near the tailstock to mesh with a gear driven from a motor. The motor is mounted across the ways on a heavy plate support.

There are a number of alternate methods of driving the arbor, but any system must provide the least possible bending of the arbor—thus the gears are located near one end of the arbor.

The shell reamer is positioned at a tapered section of the arbor in a position to allow feeding the headstock housing into it. Since the bearings should originally be drilled nearly to size, this feeding can probably be done by hand or with a lever arrangement.

If the center-rest is clamped down firmly, the brass bushing can be made to fit around a neck at the end of the arbor which will take thrust. The arbor must be fairly tight against the center, and a ball-bearing-mounted center will allow enough thrust to be applied to hold the reamer in the centerline. If the complete process is carefully done, little hand scraping of the bearings will be necessary to perfect the alignment of the bearings. *Frederick C. Lurz, Pelham, N. Y.*



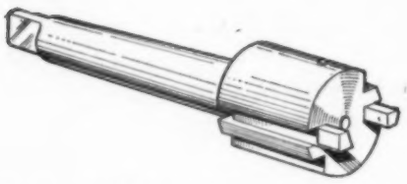
Cloth Patch with Large Drill Improves Holes in Thin Stock

Drilling large holes in thin stock can be a tricky business because the point of the drill pierces the stock before the wide part of the flutes have entered the metal. This trouble can be reduced by using a cloth patch over the point of the drill.

A square piece of cloth is cut and folded to about 2-in. square size. A lead hole is drilled in the stock, and then a finishing-size drill is used to partially re-drill the hole. The patch is then placed over the hole and final drilling is done.

During drilling the cloth packs into the flutes of the drill. This has the effect of smoothing the drilling, eliminating chatter and keeping the hole in round. It also prevents the stock from grabbing the drill after breakthrough.

The thickness of the patch can best be determined by practice. Cloth patches have been used successfully in the past and should clear up a number of drilling problems. *William S. Mazer, Chenango Bridge, N. Y.*



Boring Tool Cuts Accurate Holes

Precision boring on a drillpress was accomplished with this boring-tool holder. A pilot drill, clamped in the center hole, located the holder for cutting 1 11/16-in. holes to a 0.002-in. tolerance.

Slots to hold the tool bits were milled on a lathe with a milling attachment. With the holder held in the lathe chuck by its tapered shank, a tool-post grinder was attached for grinding the tool bits. These are held in position by two setscrews on each bit. Clearance on the bit sides and ends was ground with the attachment, and inside clearance was ground with a hand grinder.

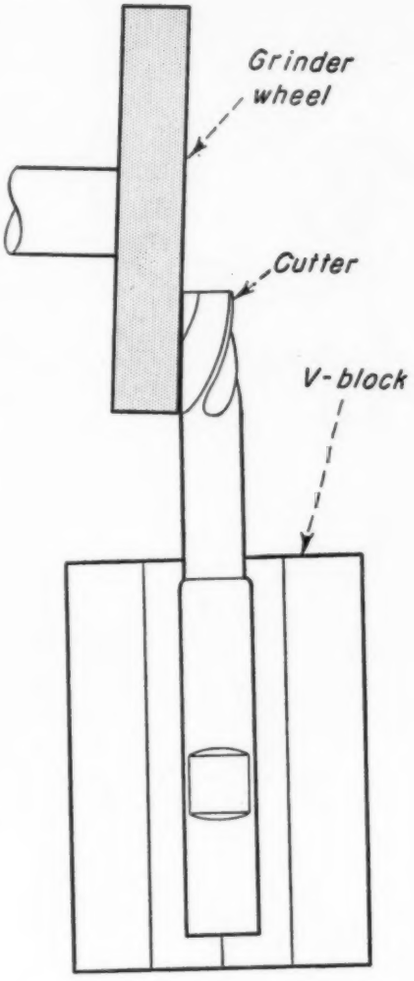
While this is a one-purpose tool, its general design is applicable to many sizes and shapes of similar accurate boring, especially where a milling machine or boring machine is not available. *R. G. Redmayne, Wilmington, N. C.*

Draft Angle Ground on Cutter For Milling Out Casting Dies

Die makers often grind down standard milling cutters to a required taper so a draft can be milled into the sides of casting dies. This job can be done quickly on a V-block setup.

A V-block is mounted on the magnetic table of a grinder and the cutter is clamped in the V. The block and cutter are then aligned at the required draft angle to the face of the grinding wheel and the cutter is ground to the depth necessary to produce the required length of tapered cutting edge.

With a magnetic table in operation, it may be possible to simply hold the cutter in place with a hand during contact. This will simplify rotating the cutter so that all edges will be ground down to the correct dimension. As an alternate method, the clamp can be turned down lightly to support hand pressure. In any case, the magnetic force will do much of the holding if a light cut is taken. The cutter must be hand-relieved as a final operation. *John P. Harrington, Fall River, Mass.*



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56th Selection—F. Webster's Drilling a Minute Hole in Block

NEWS OF METALWORKING

Drastic Changes In Steel Buying Methods Doubted

NEW YORK—Steel users will continue without immediate drastic changes in their present buying procedure despite the abandonment by steel companies of the basing-point system of pricing their products. Some are already feeling price increases of $2 to $4 a ton while others in ideal locations are experiencing smaller decreases.

The new policy, first announced by United States Steel Corp., means that hereafter steel will be quoted on an f.o.b. mill basis and customers will be compelled to pay the real freight charges to destination. No longer will steel mills absorb some of the freight cost to meet competitive delivered prices or charge "phantom freight" in other cases.

Reasons why users will move slowly in shifting from present steel sources: 1) customers won't risk switching from one mill to another as long as steel is so tight. Getting the steel needed is more important just now than a few dollars' difference in price; 2) customers want time in which to study the full implications of the new policy before making any major moves; 3) Congress will be asked to pass legislation legalizing the basing-point system and restoring it to use. Thus this situation may be temporary.

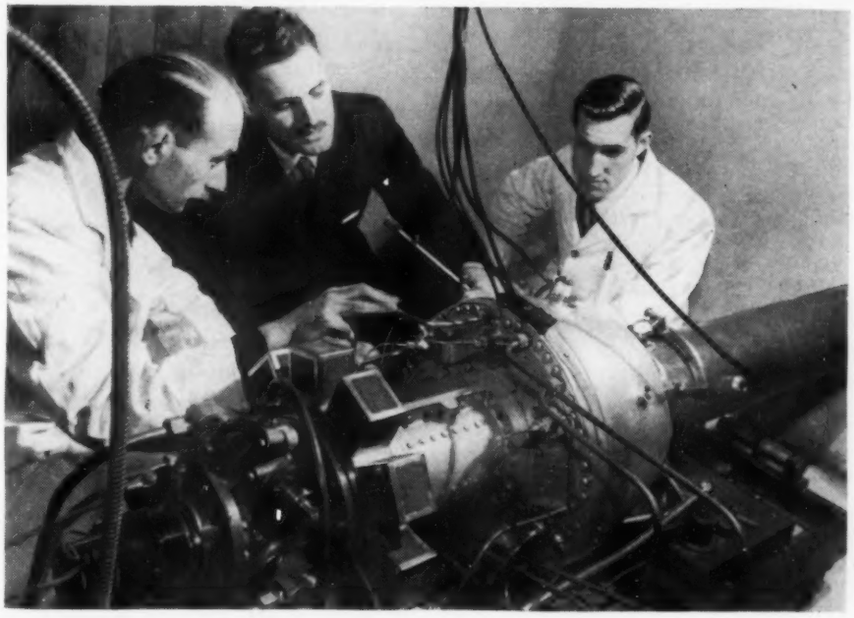
Whatever the final implications of the new policy, startling changes will not occur overnight. Perhaps if the policy should stick, it will be advisable for steel users to cluster themselves around centers of steel production. That would mean a change in location of many plants which otherwise would be at a disadvantage competitively. But it is not realistic to anticipate wholesale shifts in locations in the near future.

It is probable that many steel users will adopt a policy of buying from only one source or from only a few, instead of having a number. That probably will not be possible, however, in the case of users taking large tonnages. Steel mills with a sufficient local market to absorb all or most of their tonnage will be in a lush situation. They will have less competition from outside mills which may have to resort to cutting list prices to get local business.

Some observers see the doom of steel-producing centers far removed from consuming points. Pittsburgh, for one, will be at a disadvantage. New mills yet to be built are likely to be constructed close to steel fabricating cities, or on the spot.

Steel jobbers are in a quandary as to how to price their items. A warehouse is apt to pay different prices for exactly the same grade and size of steel, if purchased from more than one mill. It will not always be able to buy from the nearest mill with the lowest freight rate.

A large consumer of steel in the East reported that as a result of a survey of its various plants that approximately $2 to $4-a-ton increase in the cost of steel would be likely. The concern buys from approximately 40 sources and the opportunity for getting steel from closer mills is impossible due to lack of capacity to meet the firm's requirements.



***GAS-TURBINE** road transports are visualized by the British inventors of this gas turbine unit, which is now being tested in a specially-built saloon chassis. It will run on diesel oil, without vibration or exhaust fumes.*

Location of Steel Mills and Products Produced by States

ALABAMA—Shapes; Plates; Rails; Splice Bars; Track Spikes; Bars: Hot Rolled, Concrete; Wire Rods; Wire: Plain, Galvanized, Barbed, Woven Fence. Nails and Staples, Bale Ties; Black Plate; Tin and Terne Plate; Sheets: Hot Rolled, Galvanized; Strip. Hot Rolled; Axles; Bolts, Nuts.

Mills: Gadsden, Anniston, Ensley Fairfield, Birmingham, Bessemer.

CALIFORNIA — Shapes; Plates; Splice Bars; Track Spikes; Bars: Hot Rolled, Concrete, Cold Finished; Skelp; Pipe and Tubes. Wire Rods; Wire: Plain Galvanized, Barbed, Woven Fence, Nails and Staples, Bale Ties; Tin and Terne Plate: Sheets: Hot Rolled, Galvanized; Strip: Hot Rolled, Cold Rolled; Bolts, Nuts, Rivets, Washers.

Mills: Pittsburgh, Emeryville, San Francisco, Niles, S. San Francisco, Azusa, Fontana, Los Angeles, Torrance.

COLORADO—Shapes; Plates; Rails; Splice Bars; Track Spikes; Bars; Hot Rolled, Concrete; Wire Rods; Wire: Plain, Galvanized, Barbed, Woven Fence, Nails, and Staples, Bale Ties; Strip: Hot Rolled; Bolts; Nut Rivets, Washers.

Mills: Pueblo.

CONNECTICUT—Bars; Cold Finished; Wire: Plain, Galvanized; Strip: Hot Rolled, Cold Rolled.

(Continued on page 114)

Mills: Putnam, Hartford, East Hartford, Bristol, New Britain, Wallingford, Shelton, New Haven, Branford, Brideport.

DELAWARE—Plates.

Mills: Claymont.

GEORGIA—Bars: Hot Rolled, Concrete; Wire Rods; Wire Plain, Galvanized, Barbed, Woven Fence, Nails and Staples, Bale Ties; Strip: Hot Rolled, Galvanized; Bolts, Nuts.

Mills: Atlanta.

ILLINOIS—Shapes; Plates; Splice Bars, Track Spikes; Bars, Hot Rolled, Concrete, Tool Steel, Cold Finish; Skelp; Rounds for Seamless; Pipe and Tubes; Wire Rods; Wire: Plain Galvanized, Barbed, Woven Fence, Nails and Staples, Bale Ties; Tin and Terne Plate; Sheets: Hot Rolled, Cold Rolled, Galvanized; Strip: Hot Rolled, Cold Rolled, Galvanized; Bolts, Nuts, Rivets, Washers.

Mills: Waukegan, Evanston, Chicago, Cicero, S. Chicago, Harvey, Chicago Hts., Joliet, Sterling, Moline, Peoria, Alton, Granite City, Madison.

INDIANA—Shapes; Piling; Plates; Rails; Splice Bars; Track Spikes: Bars: Hot Rolled, Concrete, Cold Finished; Skelp; Rounds for Seamless; Pipe and Tubes; Wire Rods; Wire: Plain, Galvanized, Barbed, Woven Fence, Nails and Staples, Bale Ties; Black Plate; Tin and Terne Plate; Sheets: Hot Rolled, Cold Rolled, Galvanized, Long Terne; Strip: Hot Rolled; Wheels; Axles; Bolts, Nuts, Rivets, Washers.

Mills: E. Chicago, Indiana Harbor, Hammond, Gary, Fort Wayne, Kokomo, Anderson, New Castle, Indianapolis, Terre Haute, Crawfordsville.

IOWA — Wire: Plain, Galvanized, Barbed, Woven Fence, Bale Ties, Nails and Staples.

Mills: Davenport.

KENTUCKY — Plates; Bars: Hot Rolled; Sheets: Hot Rolled, Galvanized, Long Terne.

Mills: Newport, Ashland, Louisville.

MARYLAND—Plates; Rails; Bars: Hot Rolled, Concrete, Cold Fnished; Skelp; Pipe and Tubes; Wire Rods; Wire: Plain, Galvanized, Barbed, Nails and Staples, Bale Ties; Black Plate; Tin and Terne Plate; Sheets: Hot Rolled, Cold Rolled, Galvanized.

Mills: Cumberland, Baltimore, Sparrows Point.

MASSACHUSETTS — Bars: Hot Rolled, Concrete, Cold Finished; Wire Rods; Wire: Plain, Galvanized, Nails and Staples; Strip: Cold Rolled, Galvanized.

Mills: Medford, Worcester, Holyoke, Palmer, Spencer, Millbury, Mattapan, Readville, Mansfield.

MICHIGAN — Plates; Bars: Hot Rolled, Concrete, Cold Finished; Rounds for Seamless; Pipe and Tubes; Wire Rods; Wire: Plain, Galvanized, Woven Fence: Sheets; Hot Rolled, Cold Rolled; Strip: Hot Rolled, Cold Rolled.

Mill Locations

As the steel situation normalizes, purchasing agents will seek to buy from mills closer to their plants to eliminate freight charges or reduce them to a minimum.

This list of steel products and the location of mills by states may prove of help in charting potential sources as steel becomes more on a competitive basis.

Mills: Ferndale, S. Lyon, Detroit, Dearborn, Plymouth, Niles.

MINNESOTA — Shapes; Bars: Hot Rolled; Wire Rods; Wire: Plain, Galvanized, Barbed, Woven Fence, Nails, Staples, Bale Ties; Strip; Hot Rolled Strip.

Mills: Duluth.

MISSOURI — Plates, Track Spikes; Bars: Hot Rolled, Concrete, Cold Finished; Wire Rods; Wire: Plain, Galvanized, Nails, and Staples, Barbed, Woven Fence, Bale Ties; Sheets; Hot Rolled; Bolts, Nuts.

Mills: St. Louis, Kansas City.

NEW JERSEY—Bars: Hot Rolled, Tool Steel, Cold Finished; Pipe and Tubes; Wire Rods; Wire: Plain, Galvanized, Nails and Staples; Strip: Hot Rolled, Cold Rolled, Galvanized; Bolts, Nuts, Rivets, Washers.

Mills: Rockaway, Dover, Harrison, Clifton, Wallingford, Jersey City, Newark, Union, New Brunswick, Trenton, Roebling, Camden.

NEW YORK—Shapes; Piling; Plates; Rails; Splice Bars; Bars; Hot Rolled, Concrete, Tool Steel, Cold Finished; Pipe and Tubes; Wire Rods; Wire: Plain, Galvanized, Barbed, Woven Fence, Nails and Staples; Sheets: Hot Rolled, Cold Rolled, Galvanized; Strip: Hot Rolled, Cold Rolled; Bolts; Nuts, Rivets, Washers.

Mills: New York, Rome, Troy, Watervliet, Cortland, Lockport, Buffalo, Lackawanna, Dunkirk, N. Tonawanda, Tonawanda.

OHIO—Shapes; Plates; Rails; Splice Bars; Track Spikes; Bars: Hot Rolled, Concrete, Tool Steel, Cold Finished; Skelp; Rounds for Seamless; Pipe and Tubes; Wire Rods; Wire: Plain Galvanized, Barbed, Woven Fence, Nails and Staples, Bale Ties; Black Plate; Tin and Terne Plate; Sheets: Hot Rolled, Cold Rolled, Galvanized, Long Terne; Strip: Hot Rolled, Cold Rolled. Galvanized: Bolts, Nuts.

Mills: Toledo, Fostoria, Shelby, Mansfield, Marion, Piqua, Middletown, Portsmouth, Lorain, Elyria, Cuthoga Falls, Akron, Massillon, Wooster, Gambrinus, Dover, Steubenville, E. Orwell, Cleveland, Berea, Warren, Niles, Youngstown, Canton, Alliance, E. Liverpool, Toronto, Mingo, Yorkville, McDonald, Hubbard, Campbell, Lowellville, Zanesville.

OKLAHOMA — Bars; Hot Rolled, Concrete.

Mills: Sand Springs.

OREGON—Bars: Hot Rolled.

Mills: Portland.

PENNSYLVANIA—Shapes; Piling: Plates: Rails, Splice Bars, Track Spikes, Bars: Hot Rolled, Concrete, Tool Steel, Cold Finished; Skelp; Rounds for Seamless: Pipe and Tubes; Wire Rods; Wire: Plain, Galvanized, Barbed, Woven Fence, Nails and Staples, Bale Ties; Black Plate, Tin and Terne Plate; Sheets: Hot Rolled, Cold Rolled, Galvanized, Long Terne, Strip: Hot Rolled, Cold Rolled, Galvanized; Wheels; Axles; Bolts, Nuts, Rivets, Washers.

Mills: Farrell, Sharon, Wheatland, New Castle, Ellwood City, Monaca, Midland, Ambridge, Washington, Butler, East Butler, Beaver Falls, Aliquippa, Pittsburgh, Latrobe, Donora, Monessen, Allenport, Corrv, Titusville, Oil City, Franklin, W. Leechburg, Vandergrift, Apollo, Johnstown, Williamsport, Avis, Milton, Berwick, Danville, Burnham, Bethlehem, Lebanon, Reading, Harrisburg, Pine Forge, Steelton, Spring City, Phoenixville, Bridgeport, Ivy Rock, Conshohocken, Columbia, Coatesville, Philadelphia, Chester, Prospect Park; Pittsburgh Region: Braeburn, Brackenridge, New Kensington, Oakmont, McKees Rocks, Etna, Munhill, Rankin, Braddock, Duquesne, McKeesport, Dravorsburg, Clairton.

RHODE ISLAND—Wire Rods; Wire: Plain; Strip: Hot Rolled, Cold Rolled.

Mills: Pawtucket, Phillipsdale.

TENNESSEE — Shapes; Bars; Hot Rolled, Concrete, Tool Steel, Strip: Hot Rolled.

Mills: Knoxville.

TEXAS—Shapes; Plates; Bars: Hot Rolled, Concrete; Wire Rods; Wire: Plain, Nails and Staples; Sheets.

Mills: Fort Worth, Houston.

UTAH—Shapes; Plates.

Mills: Geneva.

VIRGINIA — Splice Bars; Track Spikes; Bars; Hot Rolled; Axles.

Mills: Richmond.

WASHINGTON — Shapes; Plates Splice Bars; Track Spikes; Bars: Hot Rolled, Concrete, Bolts, Nuts, Rivets.

Mills: Seattle.

WEST VIRGINIA—Shapes; Rails; Splice Bars; Track Spikes; Bars; Hot Rolled, Concrete; Skelp; Pipe and Tubes; Black Plate; Tin and Terne Plate; Sheets: Hot Rolled, Cold Rolled, Galvanized, Long Terne, Strip: Hot, Cold Rolled.

Mills: Follansbee, Wheeling, Weirton, Beechbottom, Benwood, Parkersburg, Huntington.

WISCONSIN—Bars: Hot Rolled, Cold Finished; Pipe and Tubes; Wire: Plain, Galvanized, Nails, and Staples; Strip: Hot Rolled.

Mills: Green Bay, Cedarburg, Milwaukee, E. Troy, Kenosha.

Detroit — SUPPLIER-PLANT STRIKES WORRY AUTOMAKERS... GREATER STEEL DIFFICULTIES POSSIBLE... EMPLOYMENT MOUNTS

Production worries in the auto industry have moved onto a new sector. Increasing numbers of supplier plant strikes threaten to choke off output. July saw the passenger car community worried in turn over tieups at Timken-Detroit Axle Co., Campbell, Wyant & Cannon Foundry Co., and other major producers of components.

The C.W.C. tieup shortened supplies of cylinder blocks at Hudson, Ford and Lincoln, White, Reo, and others. The other walkouts were regarded as serious, but not as critical: supplies from Timken, Detroit Tube & Steel, Bower Roller Bearing, the Detroit plant of Thompson Products, and others, did not appear to be as low as castings.

The strike in the tool and die shops found the Automotive Tool & Die Mfrs. Assn. resorting to a new legal technique in its dispute with the C.I.O. Auto Workers Union. An unfair bargaining charge was filed with NLRB, based on the fact that the union is attempting to negotiate with individual shops (seeking a blanket 20¢ raise) at the same time it bargains with the Association, the contract signatory.

Living Costs Rising

The Association, and other managements, are finding a barrier to settlements at the G.M.-Chrysler levels in the fact that living costs have been rising since then. The union is making much of the claim in negotiations that by September G.M. will be forced to pay a few cents more in wages, due to its cost-of-living index agreement. Consequently, says U.A.W., current settlements should provide for this factor.

Production of cars and trucks, meanwhile, was holding to levels above 100,000 units weekly during mid-July, but forecasts were being conditioned by availability not only of steel—principal question mark of past months—but of parts from strikebound and potentially strikebound vendors.

The effect of auto output rates in June boosted Detroit factory employment to a postwar high of 489,000 wage earners, estimated the city's Board of Commerce. Wartime high was 607,000; a year ago it was 452,000. The Michigan Unemployment Compensation Commission agreed that payrolls were high: It figured that July figures would show total area employment close to, if not above, the 1,093,000 aggregate of December.

Ford now has the largest total on its rolls since the war—135,550. Rouge employment is below a year ago, however (60,000 against 63,000) because some operations have been moved to other plants. Ford's total Detroit employment is now 95,500.

General Motors now has 326,000 at work, 255,000 of them hourly-rated. The Detroit totals: 35,000 hourly and 12,000 salaried. The G.M. postwar high was reached last March, with 355,000.

Chrysler's total in all plants is just above 90,000, a record high for peacetime. About 65,000 hourly rated people are in Detroit.

Industry reaction to the abandonment of steel basing points was initially happy, then more meditative. At first blush, the auto people figured that they would now be able to get steel from distant mills which they figured the steelmasters had been less inclined to ship, due to higher absorption of freight.

This satisfying prospect—freight costs being comparatively minor against shortage conditions—did not stay in focus too long. Shortly after, the auto makers began to figure that any big consumption area, like Detroit, might find it harder now than before to get adequate requirements. The reason: Mills will pay more attention to markets near home, (where supply will outbalance demand, creating competition), and where customers will definitely be more permanent than those who will likely cut off their orders once shipments become available from nearer points.

An interesting and welcome tiding of the month was the report from Ford that construction work has finally begun on the big Research and Engineering Center announced for Dearborn two years ago. The first wing of the dynamometer building is now going up; it will be completed in early September. Each of two wings will contain 16 engine test cells.

No word has emanated from General Motors on plans for its Research Center, also announced in 1946 and, like Ford's, shelved for lack of construction steel shortly after.

At the Pontiac division of G.M., a new axle plant is now running in high gear, reaching toward capacity of 175 differentials an hour. This shop includes a differential case assembly line, first time one has been employed in a car plant. Several automatic transfer machines are included in the highly modern equipment.

JEEPSTER, Willys-Overland's new sports phaeton, is a descendant of the Jeep and is designed as a "sun car built for fun." The car weighs 2500 lbs. and offers fuel economy up to 29 miles per gallon of gas, independent front-wheel suspension, soft rear springing and low center of gravity. Its continental styling is finished in two colors, yellow with contrasting black trim, or in fire-wagon red

Nash Buys Plant

Nash Motors Div. has bought a 1-story plant, comprising 76,525 sq. ft., near its body plant at Milwaukee. The purchase, approximating $500,000, was from International Trading Co., Milwaukee. The new building will be used as a shipping point for body stampings and subassemblies processed for the Nash plant at El Segundo, Cal., a new operation.

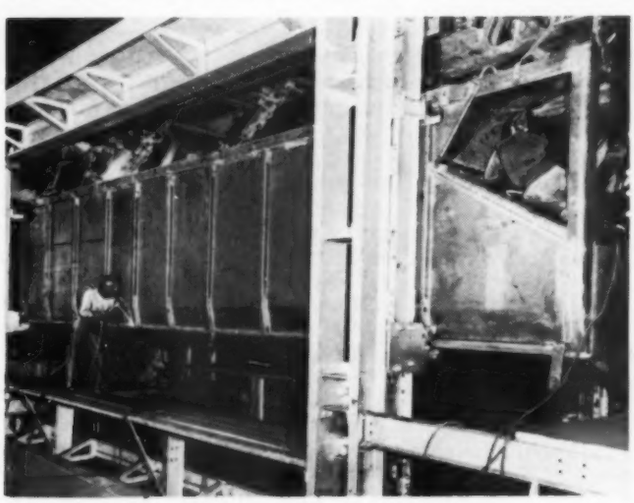
Military buying has not yet appeared in the auto industry to any notable extent, although announcements of significance can be expected shortly. Consequently, worries on the part of production men that steel will be allocated for military jobs and shorten the availability for car and truck output are being relieved.

Willys, however, has received a new order for 17,600 powerplants for replacement from the Army.

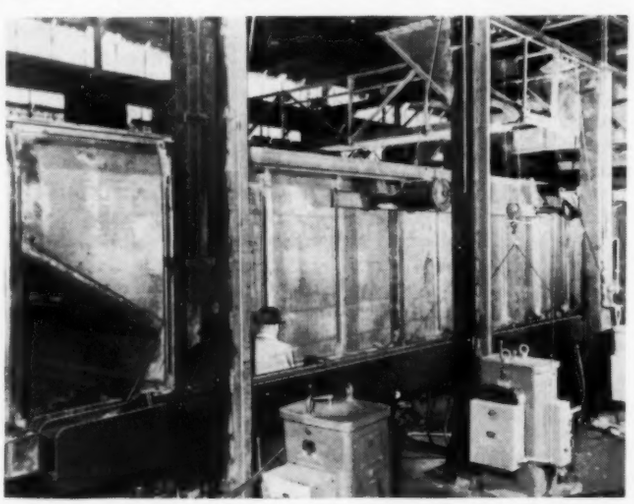
Now ACF Welds Hopper Cars Too — at 25 A Day

SEVEN SUBASSEMBLIES (trucks, underframe, hoppers, cross-ridges, floors, ends, sides) are fed into an 11-position assembly line to produce 25 all-welded 70-ton hopper coal cars per day at the Huntington, W. Va., plant of American Car & Foundry Co. The ACF-design cars are part of a 6,000-car order for the C. & O. Railroad. Line is patterned after that at Chicago on refrigerator cars (*A.M.*, Feb. 12, pages 120-123), using welding gantries and as much automatic submerged-arc welding as possible. All welding equipment is Lincoln, and many welders are retrained riveters. Changeover from riveted-car construction was made in six weeks.

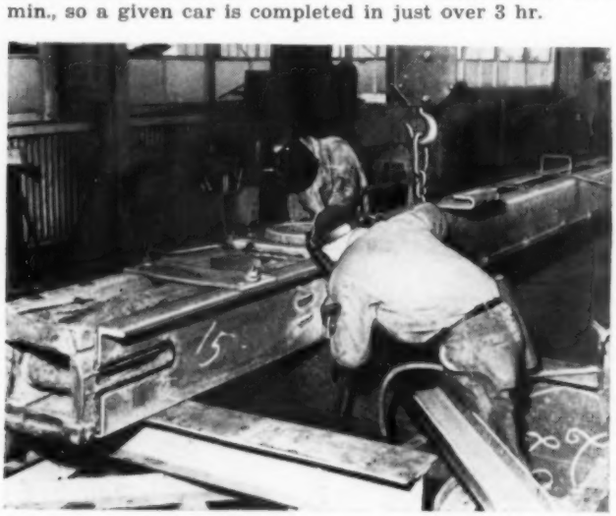
A third of a mile of welding assembles each of these coal cars



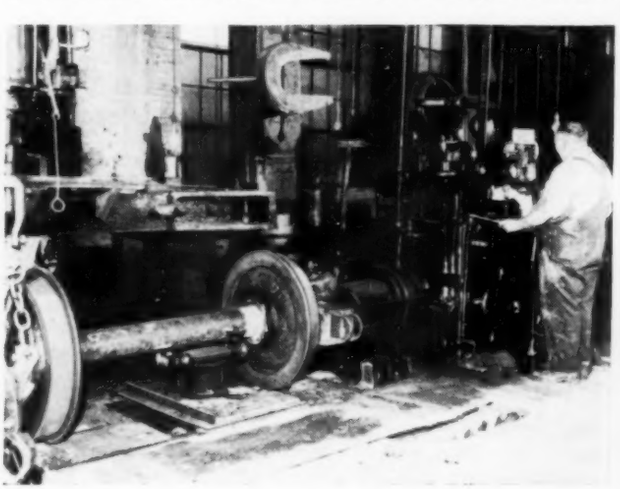
The rotator in position 10 turns the entire car upside down for final downhand welding of the underside and under the top rail. Each car has 670 ft. of flashless automatic and semiautomatic Lincolnweld. Position time is 17 min., so a given car is completed in just over 3 hr.



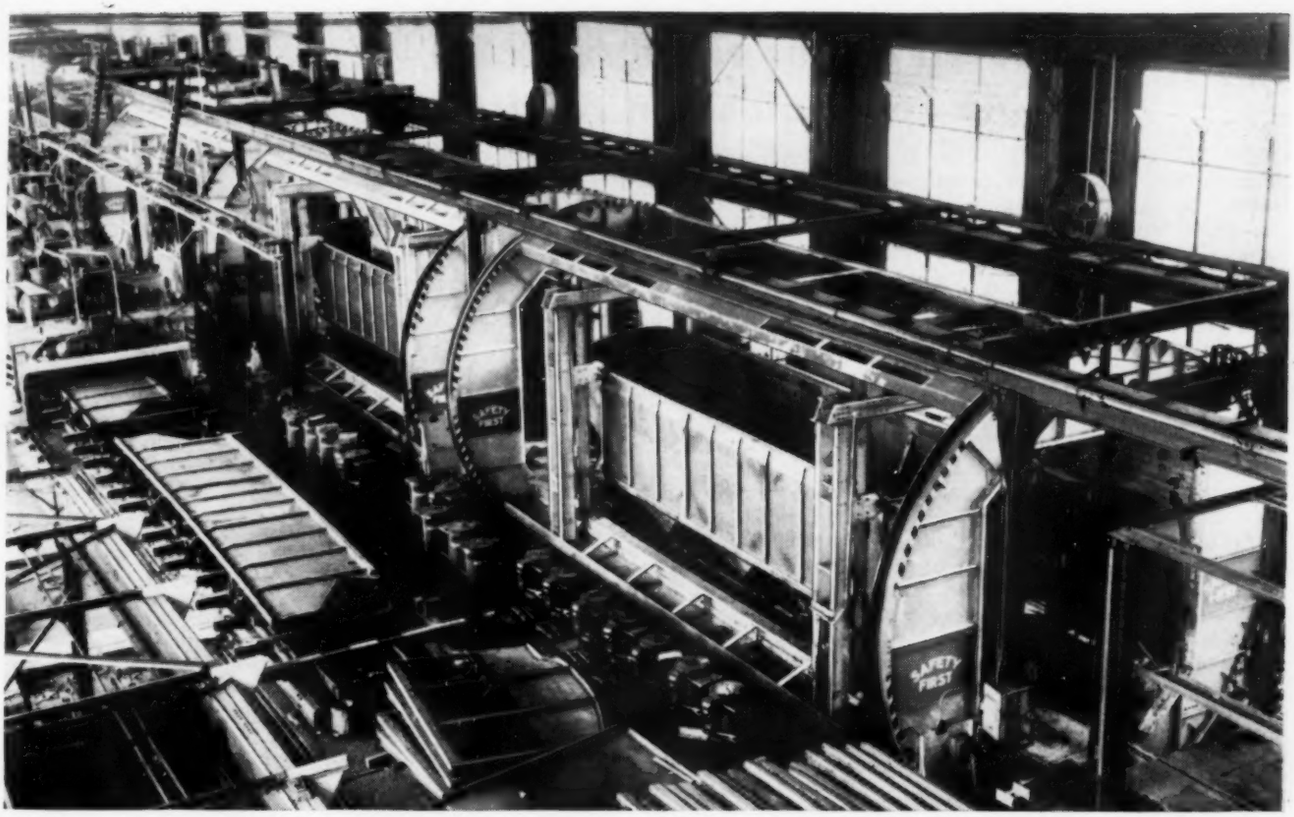
Two elements determine car shape, the cross-ridges and the sides, so both are produced in rigid fixtures. Here, at station 7, sides are held by two fixed and two movable pneumatic jacks for tackwelding. Precision to 1/64 in. or less results in cars with less than 400 lb. weight variation



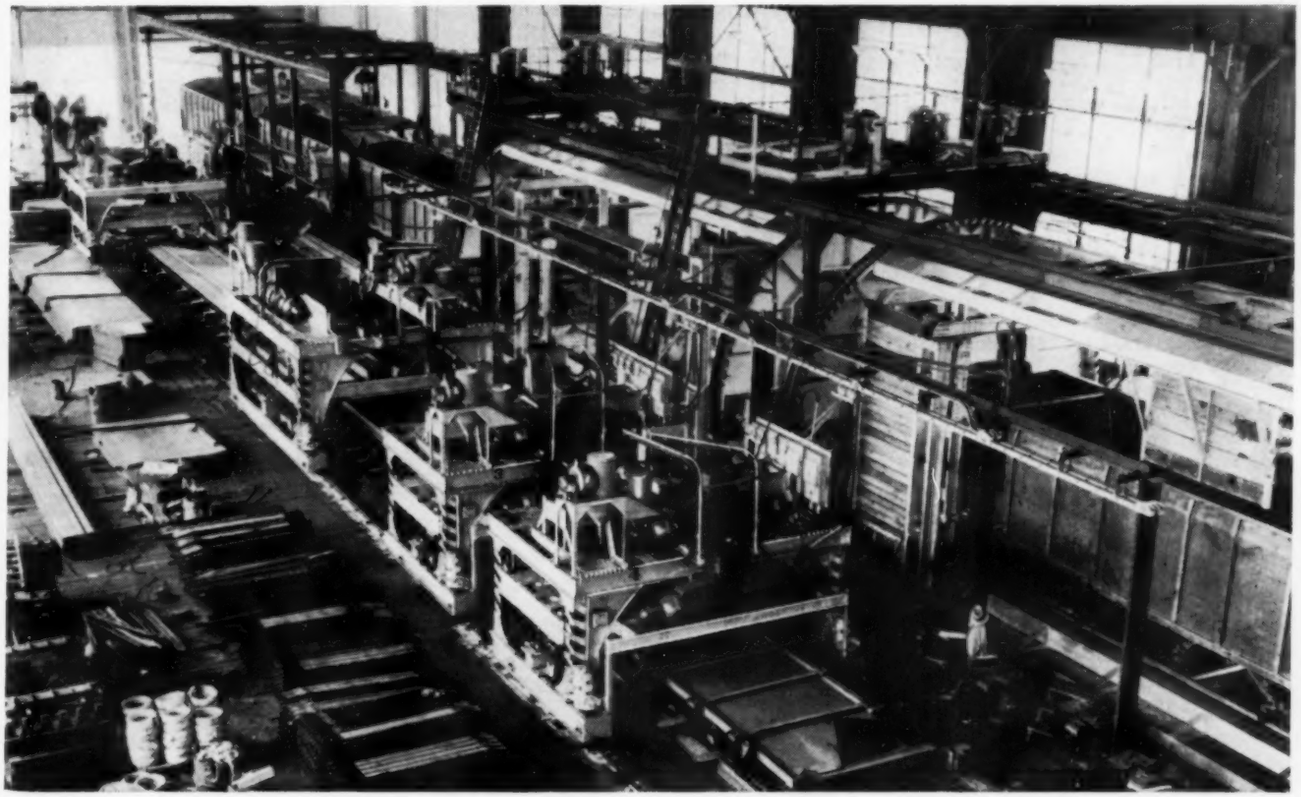
Channels, welded together, form the compact center sill. Draft sills are Z-sections welded on, as are brake-rod supports, bolsters, etc. Some are applied by hand welding, some by semi-automatic submerged arc. This subassembly requires seven positions, one on rotators



Wheel pairs are pressed onto axles at 100 tons per wheel. Span is gaged with a steel gage. This press incorporates a recorder which graphs application pressure. Here the right wheel is going on. Truck assembly is conventional, except that final assembly is done on an elevated track



Features of the line are the giant rotators at positions 8, 9 and 10. They turn tackwelded cars to right, left and upside down for final downhand welding on sides and bottom. Posts at the corners carry mechanical screw clamps which hold the car rigidly. As many as 15 ac. Lincolnweld machines are in use at each station, welders working from platforms or upon the car itself. At left are finished side and car-end sub-assemblies



Sides are automatically welded by four gantries which parallel the main line. The first gantry welds cross seams in sheets, the second the top (2 seams) and bottom rails at 70 ipm., the third the side stakes. Each side stake is welded on both edges, but ends are handwelded in assembly. All welders are automatic dc. units. Another gantry welds floor sheets. Gantries run on tracks, incorporate hydraulic clamping and elevating elements

Take Purchasing Agent as Ally, Machine Tool Salesmen Advised

ITHACA, NEW YORK—The purchasing agent or buyer must look upon the salesman as an ally, and he must have the full cooperation of the salesman if he is to accomplish the most for his own company, W. A. Sredenschek, assistant to the vice president, purchasing and traffic, General Electric Co., stressed at the Machine Tool Sales Refresher Course, Cornell University July 12-23.

Forty-three industrial and educational leaders were instructors at the course, sponsored by the National Machine Tool Builders' Association and the American Machine Tool Distributors' Association in conjunction with Cornell's Sibley School of Mechanical Engineering.

Mr. Sredenschek was one of four men who presented the customers' viewpoints. After enumerating the problems facing the buyer, he quoted Harry Erlicher, vice president in charge of purchasing at General Electric, on pitfalls which salesmen should avoid:

1. Irrelevant talk
2. Poorly presented material
3. Having too many associates with him so that buyer feels he is being "ganged" up on
4. Bluffing on answers when he is uninformed on subject
5. Exaggerating capacity of company
6. Gossip
7. Revealing information regarding processes which was learned in other plants.

Mr. Erlicher's idea of a salesman was presented in the statement:

"I respect most the salesman who knows his product and the new things being developed by his company or his industry; the man who shows interest in my problems and who can help me solve them through mutual cooperation. I will give all the time necessary to this type of salesman—yes—evenings, Sundays, or any other time."

The subject of Mr. Sredenschek's speech was "How the Machine Tool Salesman Looks to the Buyer."

Two Purchasing Reasons

Discussing "What Does the Buyer Want," W. J. Peets, chief engineer, Singer Mfg. Co., gave two main reasons for purchasing additional machine tool equipment: 1. to replace obsolete or inadequate machines now owned, 2. add equipment for additional production of either new or old design.

He pointed out that a new product must function properly at a required speed, must stand up under this speed, must be readily operable, must be easily serviced with completely interchangeable parts, and the cost of producing this item must be low so that it can be sold at a profit.

"The actual design engineering and the engineering of the manufacturing facilities for producing it," Mr. Peets said, "should take place simultaneously and not consecutively. The problem becomes one big engineering job involving product engineering and production planning. The product engineering concerns appearance, materials, test trials, etc. The production planning involves methods, sequence of operations, special machines, jig and fixture and tool design. Together, both types of engineering must consider time study and cost."

He pointed out as a dual responsibility of the sales engineer and said that he must represent his company in dealing with the buyer and represent the buyer in dealing with his company.

The sales engineer can do a job of creative selling if he thoroughly understands the problems facing the purchaser in respect to quantity, quality and method of carrying on his business, J. R. Weaver, works manager, Westinghouse Electric Corp., East Springfield Works, told the 53 industrial sales representatives taking the course.

Mr. Weaver stressed that it was not enough to improve a specific job but that a sales engineer should know whether additional equipment will be needed at other points on the output of the new machine.

"I believe that there is a danger in the overemphasis of personality in the machine tool buying and selling business. Most every trade magazine and paper one picks up these days has articles on the psychology of selling the buyer "personality." These articles are filled with 'do's' and 'don'ts'; they touch on everything from the importance of wearing the right tie to studying the eccentricities of the buyer. I believe we could do with less of the psychology of selling and better with more intense spirit of service," Mr. Weaver asserted.

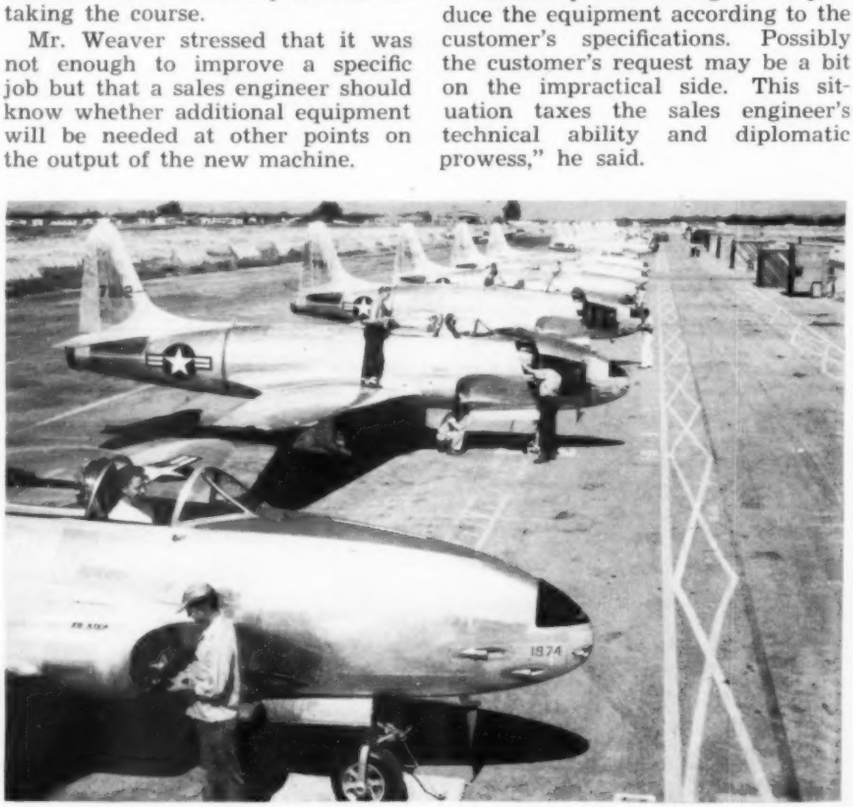
"What Information Should the Sales Engineer Give the Customer," was reviewed by Harold G. Warner, assistant master mechanic, Cadillac Motor Car Division, General Motors.

Salesman's Interest Important

"The interest shown by the sales engineer is an indication to the customer of his firm's attitude and interest in producing the piece of equipment under consideration."

He pointed out that the customer may often have a particular design feature in mind based on his previous experience and the factors involved in the production of the new part both mechanically and economically.

"Here the sales engineer is confronted with the job of selling his firm's ability and willingness to produce the equipment according to the customer's specifications. Possibly the customer's request may be a bit on the impractical side. This situation taxes the sales engineer's technical ability and diplomatic prowess," he said.



***SHOOTING STARS** are assembled on production flight line of Lockheed Aircraft Corp.'s jet testing base at Van Nuys, Calif. The Air Force has ordered this turbo-jet plane in greater quantity than any other single type aircraft*

Names in the News

B. E. BASSETT

JOHN G. SEILER

B. E. Bassett has been named regional manager of the Western Cartridge Co. Div., as well as manufacturing executive of Olin Industries to coordinate production methods of both Western Cartridge Co., and the Winchester Repeating Arms Co. division at New Haven, Conn.

Ira H. Reindel, executive engineer for the Norge Div., Borg-Warner Corp., Detroit, Mich., has announced his resignation from the company after an association of over 20 years.

Albert R. Cranks has been appointed district representative for the territory of western Pennsylvania, New Jersey, Delaware, Maryland and District of Columbia for Threadwell Tap and Die Co., Greenfield, Mass.

Dwight R. Abrams, formerly with Bell Aircraft as chief of the modification section of the Bell bomber plant at Marietta, Ga., has joined Henry & Hutchinson, design engineers of Decatur, Ga.

John Bruce Carlock has been appointed chief consulting engineer for Loftus Engineering Corp., Pittsburgh, Pa.

Douglas B. Whitney has been appointed general manager of the Harrison Radiator Div., General Motors Corp., succeeding Frank J. Hardiman who died recently.

P. F. Bauer has been named manager of the central region of Allis-Chalmers general machinery division with headquarters in Cleveland. The region embraces district office territories of Cleveland, Toledo, Pittsburgh, Youngstown, Wheeling, Cincinnati, Detroit, Grand Rapids and Jackson.

John G. Seiler has been elected executive vice president of Tube Turns, Inc., Louisville, Kentucky.

Ralph S. Poulsen of Lindberg Engineering Co., Chicago, Ill., has been appointed district sales manager for the Ohio territory.

William J. Wade has been appointed assistant to the executive vice president of Willys-Overland Motors.

S. W. Ostrander, general manager of Highland Park operations for the Ford Motor Co., Dearborn, Mich., has announced the appointments of **George Hardesty** as director of production control, **C. B. Ver Duin** as resident controller and **A. M. Wilson** as traffic manager.

George O. Linville has been named master mechanic for Studebaker Corp., South Bend, Ind.

Robert A. Morris has been appointed assistant to the president of Acme Steel Co., Chicago, Ill. **F. R. Grove** has been promoted to the position of advertising manager.

William H. Uhl has been named chief development engineer of the U. S. Postal Meter Div., Commercial Controls Corp., Rochester, N. Y.

Carl J. Snyder has been appointed general manager of the Lynch road plant of Chrysler Corp.

George W. Schultz was appointed superintendent of the truck and bus chassis division of the Highland Park plant of the Ford Motor Co.

Henry C. Grebe has been appointed director of body engineering by **Harold T. Youngren,** vice president and director of engineering and research for the Ford Motor Co.

Dwight B. Eldred has been named assistant sales manager of U. S. Tires Div., United States Rubber Co., New York, N. Y.

M. E. Nicklin has been appointed sales manager for Witte Engine Works Div. at Kansas City, it was announced by **Lloyd E. Trace,** sales vice president of this United States Steel subsidiary.

E. L. Behrends has joined the general sales department of Taylor Forge & Pipe Works, Chicago, Ill.

Peter F. Rossman has been elected president of the Symington-Gould Corp., Depew, N. Y., succeeding **J. A. Sauer.**

Charles O. Burgess has been appointed technical director of Gray Iron Founders' Society, Inc., Cleveland, Ohio, where he will establish a technical department of the society and initiate a long-range program of product improvement, technological development, handbook preparation, and technical research.

BUSINESS ITEMS

The Cleveland Tapping Machine Co., Hartville, Ohio, announces two additions to its national sales organization. **Meehan Engineering Co.,** Syracuse, N. Y., is now handling sales in upstate New York, and **Stanley Berg & Co.,** of Pittsburgh and Erie, Pa., is now the Cleveland representative in eastern Pennsylvania, West Virginia and southern Ohio.

The General Electric Co. will operate the former **Remington Rand** plant in Westover, N. Y., for the Army Air Forces.

Modern Tool Works, Limited, 69 Montcalm Ave., Toronto, Ontario, has been named Canadian distributor for **Defiance Machine Works, Inc.,** Defiance, Ohio.

Conesus Corp., Rochester, N. Y., has purchased the **National Sewing Machine Co.** at Belvedere, Ill., for $3,999,000.

The General Electric Co. will open a new plant in Brockport, N. Y., for the manufacture of electrical appliances.

The United States Testing Co., Hoboken, N. J., announced arrangements to take over the research and development activities, in specific fields, of the **Crystal Research Laboratories,** Hartford, Conn.

The Big Three Welding Equipment Co., of Houston and Fort Worth, Texas, has recently announced the opening of a new branch in Lubbock, Texas.

Combat Belief Machines Cut Jobs, MDNA Told

FRENCH LICK SPRINGS, IND.—Machine tool builders and the machinery dealer must strive to dispel the false impression in the minds of workers that machines put men out of work, William L. Dolle, president and general manager of Lodge & Shipley Co., told the Machinery Dealers' National Association at the annual meeting here July 1.

Mr. Dolle, who cited instances where workers failed to get the most out of machines due to fear of eliminating jobs, was the only speaker at the meeting outside of the association.

Ralph Hochman, first vice president of Ralph Hochman & Co., Newark, N. J., was elected president of the association. Other officers named: First vice president, Joseph T. Weiss, vice president, Interstate Machinery Co., Chicago; second vice president, Harry King, King Machinery Co., Los Angeles; treasurer, Charles Simmons, Sr., treasurer of Simmons Machine Tool Co., Albany. Mr. Hochman succeeded George B. McClennen, Delta Equipment Co. president, as association president.

Mr. McClennen, discussing "Looking Forward With MDNA," reported that the board of directors decided to publish a directory for the first time, establish a library of complete information pertaining to machine tools and industrial equipment to aid members, customers and the public, and a statistical program for the collection of basic data on the sale of used machine tools. This latter plan, Mr. McClennen said, would take two or three years to develop sufficient background material to be of substantial assistance to members in the management of his particular business.

Mr. Weiss discussed "What MDNA Means to You and Me" and Mr. Simmons talked on "The Used Machine Tool Industry Is a Key to World Stability."

Aircraft Engine Orders From U.S. Near $1 Billion

WASHINGTON — Approximately $1 billion of the $2 billion appropriation for military aircraft will go to engine manufacturers.

Five major concerns received about 50% of the business, with a host of smaller concerns getting accessory orders.

Engine orders went to:

Allison Division of General Motors at Indianapolis: 1,978 J-33 turbojets and 1,875 J-35 turbojets. This amounts to about 65% of the total jet-engine production. Current output of 200 jet engines a month will be stepped up steadily to a peak of 500 a month at the end of 1951.

Pratt & Whitney Division, United Aircraft Corp., East Hartford, Conn.: 2,760 Wasp Majors (3,500 hp.); 253 Double Wasps (2,400 hp.); 634 Nene turbojets (under license from British Rolls Royce, Ltd.); and 97 helicopter engines.

General Electric Co.: 1,250 J-47 turbojets. This is the most powerful U.S. jet engine in production. The present order is only the beginning of a stepped-up J-47 program that is expected to reach a peak in 1952. G.E. will use its present plant at Lynn, Mass., and will lease also a major part of the former Wright plant at Lockland, Ohio, near Cincinnati.

Curtiss-Wright Corp., Wood-Ridge, N.J.: 782 2,500-hp. R-3350 reciprocating engines and 665 700-hp. R-1300 reciprocating engines.

Westinghouse Electric Corp., South Philadelphia: 1,278 J-34 turbojets.

Accessory orders were received by:

Bendix Aviation Corp., with plants in Detroit, Baltimore, Los Angeles, South Bend, Ind., and Teterboro, N.J.: hydraulic systems, autopilots, brakes, generators, radios and fuel-metering systems and instruments.

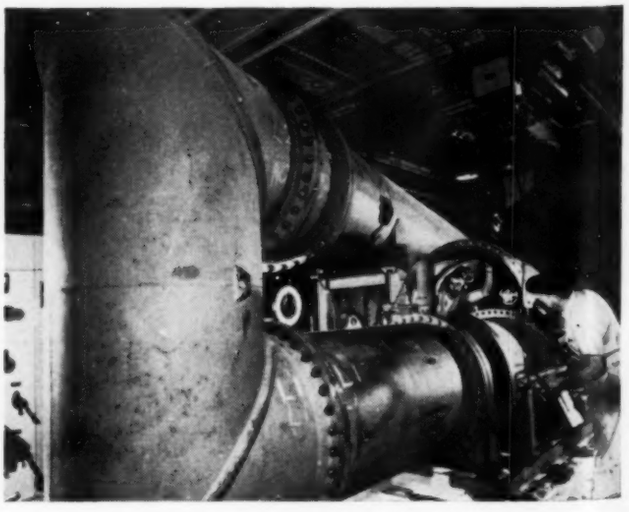
Thompson Products, Inc., Cleveland: sodium-cooled valves, turbine blades.

Pesco Products Division of Borg-Warner Corp., Cleveland: fuel pumps and oil separators.

Lear, Inc., Grand Rapids, Mich.: actuators and radios.

Kollsman Instrument division, Square D Co., New York City: flight instruments.

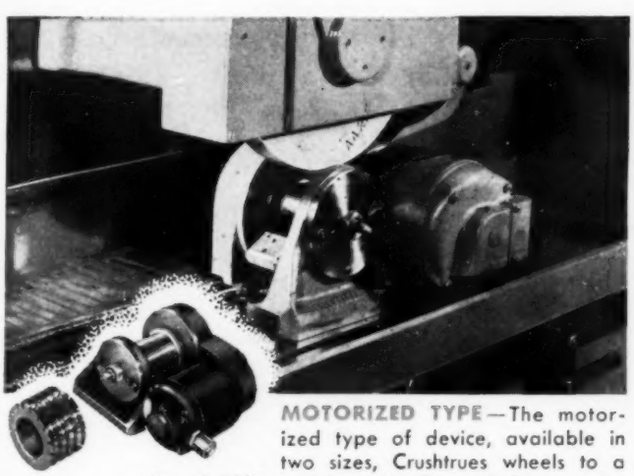
Sperry Corp., New York City: flight and engine instruments and control equipment.



HOT SPIN TEST equipment (left) drives bladed disks for the Westinghouse "Yankee" turbojets by compressed air. Heating is accomplished by radiation. Low-power model tester (below) is used in preliminary wind-tunnel studies of experimental turbines.

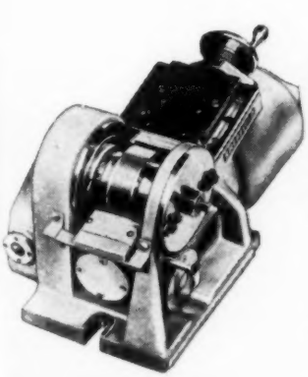
Speed jobs like these ON YOUR SURFACE GRINDER

Production and toolroom forms for flat work including form tools, punch and die sections and similar work, can be ground by a Crushtrued wheel on any standard surface grinder equipped with one of these Crushtrue Devices. In this way, the many advantages of Crushtrue grinding, including its speed, accuracy and marked economy, can be utilized with a minimum of outlay for tooling. There are three general types of Crushtrue Devices.



MOTORIZED TYPE—The motorized type of device, available in two sizes, Crushtrues wheels to a width of 3⅛" and is generally used for quantity production operations.

IDLER TYPE—The idler type is also available in two sizes. The smaller is used on grinders employing wheels up to 1" face. The larger utilizes wheels up to 3⅛" face. The units are generally used on grinders which have a slow speed spindle drive (approximately 300 fpm).



SELF-TRUING TYPE

The self-truing type is engineered especially for producing parts which must be held to a very high degree of uniformity. It incorporates a flat carbide form tool which is used to periodically reform the cast iron Crushtrue Roll without removing the roll from its mounting.

CRUSHTRUE ROLLS

Sheffield is prepared to regrind promptly, any Crushtrue Roll after it has become sufficiently worn in service. In addition to that, a large stock of standard rolls is maintained for immediate delivery or in exchange for rolls sent in to be reground. The Bank includes all Standard U.S. threads from 8 to 32 pitch inclusive.

Sheffield **would like to send you new literature describing Crushtrue grinding and its outstanding economic advantages.**

Thread and Form Grinders
Microform and Visualform Grinders
Gear Chamfering
Burring and Burnishing Machines
Crushtrue Rolls and Fixtures
Special Machine Tools

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American Machinist REFERENCE BOOK SHEET

Process Sheet for Chromising Steel

BY GEORGE BLACK

Chromising is a general term covering various methods for producing on the surface of iron and steel parts an integral layer high in chromium. The coating is formed by means of diffusion at relatively high temperatures, the most common method consisting of exposing articles to be treated to a chromous-chloride atmosphere under controlled temperature. Work that has been treated includes: exhaust manifolds, bolts, milk cans and tubing. Advantages claimed for chromised surfaces are: excellent corrosion and wear resistance (greater than plating) minimum of surface preparation; complete coverage of the surface; extended service life; low consumption of chromium; and freedom from flaking or pitting because the coating is integral with the surface. The treated material can be rolled, bent or flanged without damage.

Preparation of Chromising Agent

PREPARE MIXTURE — A steel retort is filled with a mixture of broken unglazed porcelain crockery, which acts like a sponge, and ferro-chromium in approximately equal parts.

DISPLACE AIR — After inclining the retort at 45°, hydrogen is passed through the contents until all air is displaced.

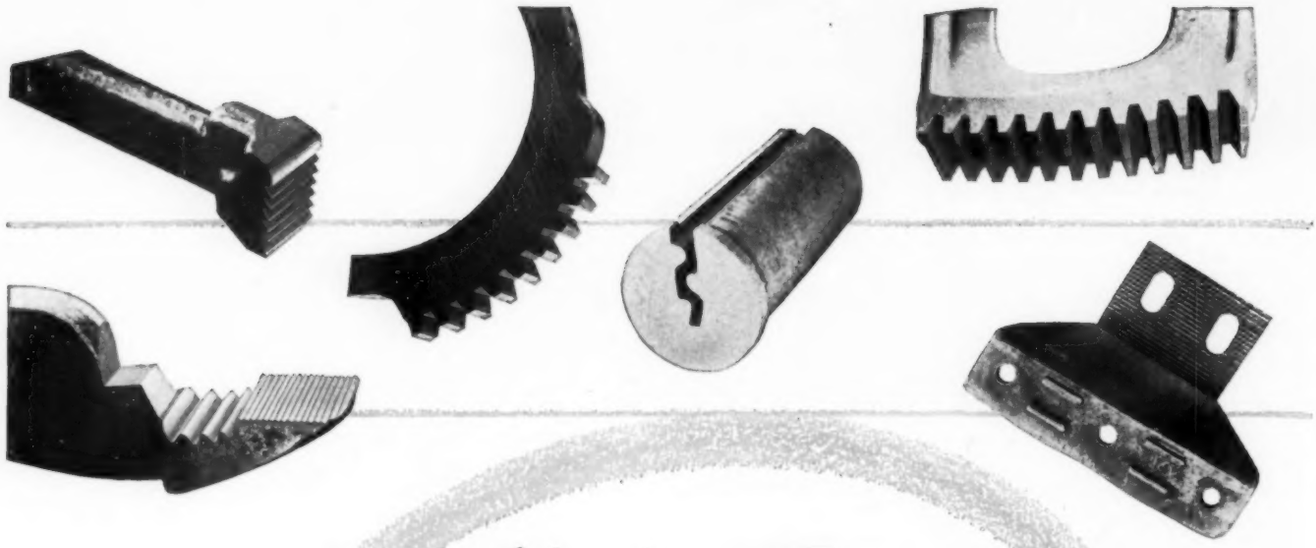
HEAT IN FURNACE — Hold for 5 hr. in gas-fired furnace at 1000 C., and pump hydrogen chloride into retort. At the end of this time, hydrogen is again passed through.

COOL IN AIR — The porcelain mass is removed after cooling and stored until needed for chromising. The chromous-chloride content is easily measured by specific-gravity tests.

Chromising

DEGREASE — Conventional equipment may be used.

CHROMISE — Parts to be chromised are packed into retort along with the chromous-chloride charged porcelain mass. The retort is then placed in the furnace and heated for 5 hr. at 1000-1050 C. At this temperature, the chromous chloride reacts with iron in the surface of the material, forming ferrous chloride, which passes off as a gas, leaving chromium to deposit on and diffuse into the surface of the material.



Machine Faster—

TEETH, SERRATIONS AND SLOTS

Slots, serrations, teeth, flat and curved sections are all being surface broached on many jobs faster, more accurately and at less cost than they had formerly been machined. Surface broaching is applicable to steel, cast iron, bronze, copper or aluminum parts. Machines may be tooled up for one specific operation but in many cases more than one part can be surface broached on one machine by using additional sets of tooling. May we work with you in finding where Footburt Surface Broaching Machines can save you money in your plant?

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

FOOTBURT *Surface Broaching*

FOOTBURT PATENTED TOOTH FORM

STAMPING DATA—I

These practices are followed by automobile manufacturers and agricultural implement makers, and are incorporated in their handbooks of engineering standards.

BLANK DEVELOPMENT. It is not general practice to show blank developments on production drawings. Therefore, the following formulas and illustration are presented for reference purposes only.

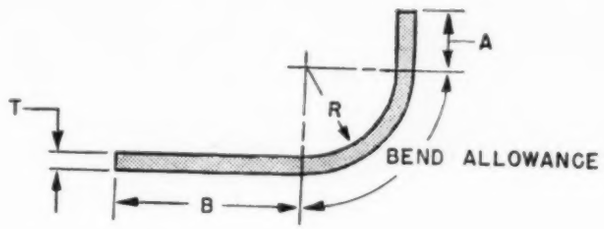
The formula, below, may be used for blank development:

Total Length = A + B + Bend Allowance.

BEND ALLOWANCE. The bend allowances shown in the table were computed by the formula:

Length for 90° bend = $\frac{\pi}{2}$ (R + 1/3T). See illustration.

The chart also indicates the bend allowance for each degree of bend. For instance, when a 30° bend is specified, it is only necessary to multiply 30 by the length given for 1° in order to determine the bend allowance.



BEND ALLOWANCE CHART

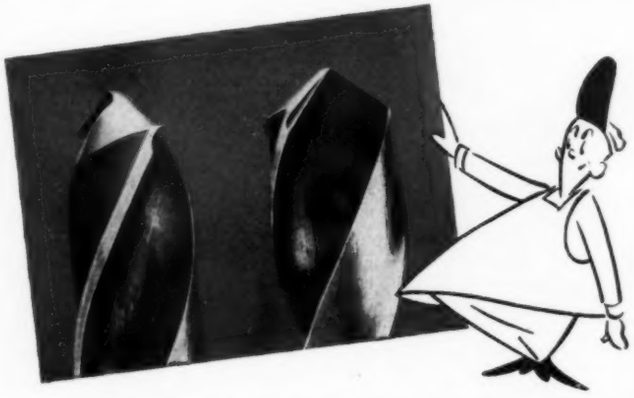
METAL THICKNESS		.024	.027	.030	.033	.035	.047	.059	.067	.075	.089	.105	.120	.135
RAD.	DEG.	BEND ALLOWANCE												
.016	1	.0004	.0004	.0004	.0004	.0005	.0005	.0006	.0007	.0007	.0008	.0009	.0010	.0011
	90	.038	.039	.041	.042	.044	.050	.055	.060	.064	.070	.080	.088	.096
.031	1	.0007	.0007	.0007	.0007	.0008	.0008	.0008	.0008	.0009	.0010	.0011	.0012	.0013
	90	.061	.063	.064	.066	.068	.075	.077	.080	.088	.090	.104	.111	.119
.047	1	.0009	.0010	.0010	.0010	.0010	.0010	.0011	.0012	.0012	.0013	.0014	.0015	.0016
	90	.086	.088	.090	.091	.093	.097	.105	.108	.113	.121	.129	.137	.144
.062	1	.0012	.0012	.0012	.0012	.0012	.0013	.0014	.0014	.0015	.0016	.0017	.0017	.0018
	90	.110	.112	.113	.115	.116	.123	.129	.132	.137	.145	.152	.160	.168
.078	1	.0015	.0015	.0015	.0015	.0015	.0016	.0017	.0017	.0018	.0018	.0019	.0020	.0021
	90	.135	.137	.138	.140	.141	.148	.154	.157	.162	.170	.178	.185	.193
.094	1	.0018	.0018	.0018	.0018	.0018	.0019	.0019	.0020	.0020	.0021	.0022	.0023	.0024
	90	.160	.162	.163	.165	.167	.173	.179	.182	.187	.195	.203	.211	.218
.109	1	.0020	.0020	.0020	.0021	.0021	.0021	.0022	.0022	.0023	.0024	.0025	.0026	.0027
	90	.184	.185	.187	.189	.190	.196	.203	.206	.211	.218	.226	.234	.242
.125	1	.0023	.0023	.0023	.0023	.0023	.0024	.0025	.0025	.0026	.0027	.0028	.0028	.0028
	90	.209	.211	.212	.214	.215	.222	.228	.231	.236	.244	.251	.259	.267
.141	1	.0026	.0026	.0026	.0026	.0026	.0027	.0028	.0028	.0029	.0029	.0030	.0031	.0032
	90	.234	.236	.237	.239	.240	.247	.253	.256	.261	.269	.276	.284	.292
.156	1	.0028	.0028	.0029	.0029	.0029	.0030	.0030	.0031	.0031	.0032	.0033	.0034	.0035
	90	.258	.259	.261	.262	.264	.270	.276	.280	.284	.292	.300	.308	.315
.172	1	.0031	.0031	.0031	.0031	.0032	.0032	.0033	.0033	.0034	.0035	.0036	.0037	.0038
	90	.283	.284	.286	.287	.289	.295	.302	.305	.309	.317	.325	.333	.341
.188	1	.0034	.0034	.0034	.0034	.0034	.0035	.0036	.0036	.0037	.0038	.0039	.0039	.0040
	90	.308	.309	.311	.313	.314	.320	.327	.330	.335	.342	.350	.358	.366
.203	1	.0037	.0037	.0037	.0037	.0037	.0038	.0038	.0039	.0039	.0040	.0041	.0042	.0043
	90	.331	.333	.335	.336	.338	.344	.350	.353	.358	.366	.374	.382	.390
.219	1	.0039	.0039	.0040	.0040	.0040	.0041	.0041	.0042	.0042	.0043	.0044	.0045	.0046
	90	.357	.358	.360	.361	.363	.369	.375	.379	.383	.391	.399	.407	.415
.234	1	.0041	.0041	.0043	.0043	.0043	.0044	.0044	.0045	.0045	.0046	.0047	.0048	.0049
	90	.380	.382	.383	.385	.386	.393	.399	.402	.407	.415	.423	.430	.438
.250	1	.0045	.0045	.0045	.0046	.0046	.0046	.0047	.0047	.0048	.0049	.0049	.0051	.0051
	90	.405	.407	.408	.410	.412	.418	.424	.427	.432	.440	.448	.456	.463

Trouble-saving tips on machining ...by Stainless Sam

1 Bushings should be *short* when you are using a drill jig. This makes it possible to use a short drill. Removable bushings can be used if chip congestion in the bushing is a serious problem.

2 Thinning of the web *at the point* of a drill, by grinding at the spot indicated by Stainless Sam, reduces the bearing area of the drill and makes drilling easier. The shoulder gives the cutting edge greater strength because it is backed up.

3 Stainless Sam recommends a three-cornered punch when you center-punch ARMCO Stainless Steels. Marking the work *lightly* prevents excessive work-hardening of the metal at the mark and provides easier starting of the drill.



4 This drill grind aids in chip disposal. Drills should be backed out at intervals to relieve chip congestion. The general rule for automatic screw machine work is three to four times diameter of drill on first insertion, one to two diameters for second, and three-quarters for the third and fourth.

If you are not using ARMCO Stainless Steel bars or wire, perhaps parts of your equipment or products could benefit by these rustless metals—often at *no increase in cost*. ARMCO Stainless resists heat and corrosion, adds strength and beauty to the products you make.

For complete up-to-the-minute information on drilling and other machining operations, write for a copy of the ARMCO booklet, "Machining of ARMCO Stainless Steels."

And remember, ARMCO Stainless Steel bars, wire and angles are available for quick delivery. Just address Armco Steel Corporation, 260 Curtis St., Middletown, O. Or call our nearest district office or ARMCO Distributor.

Export: The Armco International Corporation.

ARMCO

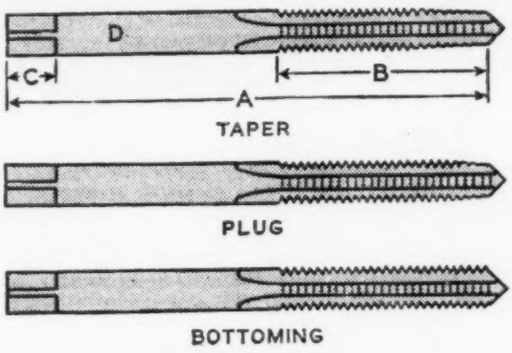
STAINLESS STEELS

ARMCO

Machine Screw Taps

Source: American Standard B 5.4—1948, entitled "Taps," and published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

REGULAR (STANDARD) MACHINE SCREW TAPS



Carbon Steel—Cut Thread
High-Speed Steel—Cut Thread
High-Speed Steel—Commercial Ground Thread
High-Speed Steel—Precision Ground Thread

All dimensions are given in inches.

These taps are furnished with American National Form of thread and standard number of flutes in taper, plug, or bottoming style.

Carbon steel taps having an optional number of flutes are furnished in plug style only.

High-speed taps having an optional number of flutes will be furnished in plug or bottoming style.

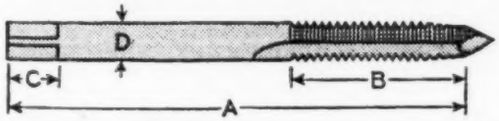
High-speed steel taps are regularly furnished as follows:

Cut thread	No. 3 to 14, incl.
Commercial ground thread	No. 3 to 14, incl.
Precision ground thread	No. 0 to 12, incl.

All taps have external center on thread end.

Screw Gage Number	Basic Major Diameter	Threads per Inch						Number of Flutes			Dimensions				
		Carbon Steel			High-Speed Steel			Standard	Optional		Length Overall	Length of Full Thread	Length of Square	Diameter of Shank	Size of Square
		NC	NF	NS	NC	NF	NS		Carbon Steel	High-Speed Steel	A	B	C	D	E
0	0.060	..	80	..	..	80	..	2	..	..	1 5/8	5/16	3/16	0.141	0.110
1	0.073	64	72	56	64	72	56	2	..	..	1 11/16	3/8	3/16	0.141	0.110
2	0.086	56	64	..	56	64	..	3	..	2	1 3/4	7/16	3/16	0.141	0.110
3	0.099	48	56	..	48	56	..	3	..	2	1 13/16	1/2	3/16	0.141	0.110
4	0.112	40	48	32, 36	40	48	36	3	..	2	1 7/8	9/16	3/16	0.141	0.110
5	0.125	40	44	..	40	44	..	3	..	2	1 15/16	5/8	3/16	0.141	0.110
6	0.138	32	40	36	32	40	..	3	..	2	2	11/16	3/16	0.141	0.110
8	0.164	32	36	40	32	36	..	4	..	2, 3	2 1/8	3/4	1/4	0.168	0.131
8	0.164	32	..	..	..	..	..	..	3	..	2 1/8	3/4	1/4	0.168	0.131
10	0.190	24	32	30	24	32	..	4	..	2, 3	2 3/8	7/8	1/4	0.194	0.152
10	0.190	24	32	..	..	..	..	..	3	..	2 3/8	7/8	1/4	0.194	0.152
12	0.216	24	28	32	24	28	..	4	..	..	2 3/8	15/16	9/32	0.220	0.165
14	0.242	..	..	20, 24	..	..	20, 24	4	..	..	2 1/2	1	9/32	0.247	0.185

SPIRAL POINTED MACHINE SCREW TAPS

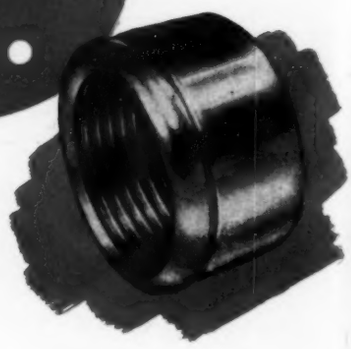


Cut thread taps are furnished with American National Form of thread in plug style; ground thread taps are furnished in plug or bottoming style.

All taps have external center on thread end.

Screw Gage Number	Basic Major Diameter	Threads per Inch						Number of Flutes	Dimensions				
		Carbon Steel			High-Speed Steel				Length Overall	Length of Full Thread	Length of Square	Diameter of Shank	Size of Square
		NC	NF	NS	NC	NF	NS		A	B	C	D	E
3	0.099	48	56	..	48	56	..	2	1 13/16	1/2	3/16	0.141	0.110
4	0.112	40	48	36	40	48	36	2	1 7/8	9/16	3/16	0.141	0.110
5	0.125	40	44	..	40	44	..	2	1 15/16	5/8	3/16	0.141	0.110
6	0.138	32	40	..	32	40	..	2	2	11/16	3/16	0.141	0.110
8	0.164	32	36	..	32	36	..	2	2 1/8	3/4	1/4	0.168	0.131
10	0.190	24	32	..	24	32	..	2	2 3/8	7/8	1/4	0.194	0.152
12	0.216	24	28	..	24	28	..	2	2 3/8	15/16	9/32	0.220	0.165
14	0.242	..	..	20, 24	..	..	20, 24	2	2 1/2	1	9/32	0.247	0.185

A Finished Piece Every 2.5 Seconds..



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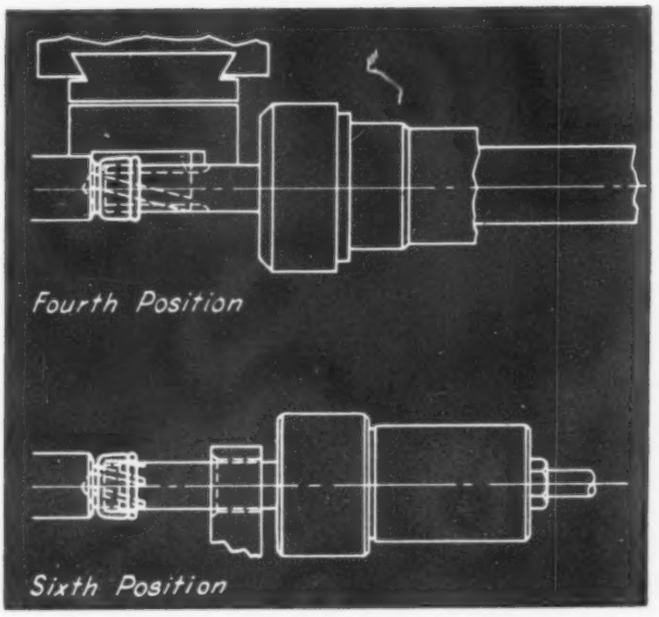
● **High Speeds** ● **Heavy Feeds** ● **Carbide Tooling**

"You can't drive a spike with a tack hammer." You just can't handle the high speeds and heavy feeds that, with carbides, mean high production unless you have a machine that is built from the ground up to do the job.

Here's a case where a carbide-tooled New Britain Model 601 automatic screw machine operating at spindle speeds of 3352 RPM, with a forming SFM of 1098, produces 1433 finished pieces per hour. Eight operations complete the aluminum ferrule, illustrated. Two of these operations shown at the right eliminate secondary finishing work.

Carbides can mean new standards in speed and economy in your plant. To help you attain them New Britain makes the only automatic screw machines designed with the power, speed, weight and rigidity to get the full benefit with carbides.

After forming and drilling in the first three positions a carbide skiving tool with no back clearance burnishes the piece eliminating a secondary polishing operation and readying the part for immediate plating.



Tapping is done in the fifth position. Breaking through the 7/64" radius, a finish reamer cuts off in #6. This leaves a complete radius blending in with the back face as specified by the manufacturer. The piece is stripped from the reamer on drawback stroke. Ordinary cut-off methods would have required secondary grinding.

Write for descriptive literature on new Models 601 and 602

Easily accessible cams, directly behind cross slides, eliminate deflection and permit heavy forming cuts of carbides.

THE NEW BRITAIN MACHINE CO.
NB
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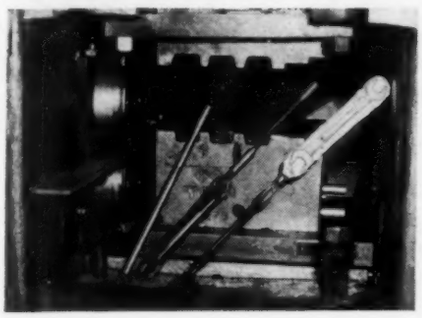
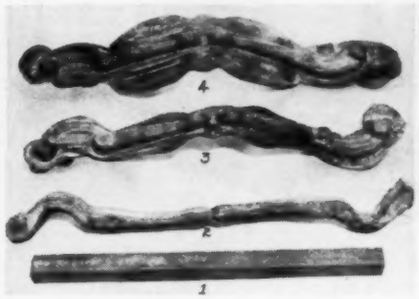
NEW BRITAIN
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Shop Equipment News



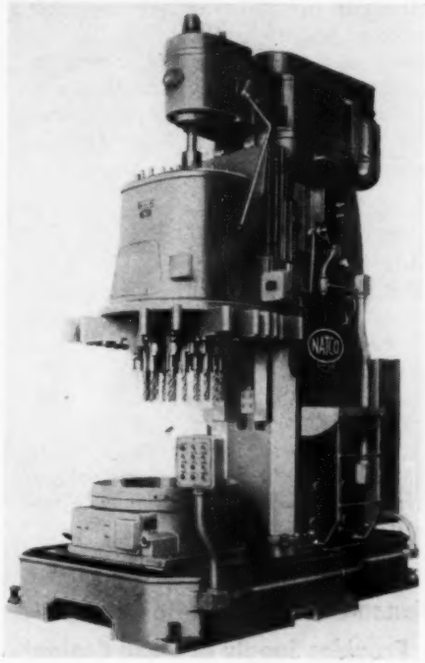


Maxirolling Forging Technique Makes Blanks for Final Forging

The National Machinery Co., Tiffin, Ohio, introduces the Maxirolling forging technique. A Maxipres prepares blanks with accurately reduced sections. The stock is distributed to meet the requirements of the final forging. The Maxiroll, the auxiliary attachment which does the preforming, consists of a pair of reducing rolls mounted in a side window of the press.

A roll and die arrangement for forging double-ended wrenches is illustrated, left. Dies used are those regularly used for producing the job on a hammer. The final die design recommended for the Maxipres would be quite different and much lighter. The double-length stock is shown at the left. In the center, the forging is shown with one end completed and the opposite end rolled preparatory to the forging of the second wrench. The completed forging on the right has a minimum of flash and scale.

The illustration, right, shows an automotive steering arm. The stock (1) is sufficient for two forgings and is 1 1/16 in. square and 16¾ in. long. The breakdown (2) is handled in one stroke in rolls similar to those shown in the above illustration. The double forging shown at (3) was produced from the preformed blank (2) in the same dies used for producing the job in a Maxipres without the new rolling attachment. As shown in (3) the forging is sharp and well filled with an exceedingly small amount of well distributed flash. At (4) is shown the forging produced in the same set of dies before the Maxiroll attachment was available, showing considerably more flash present.

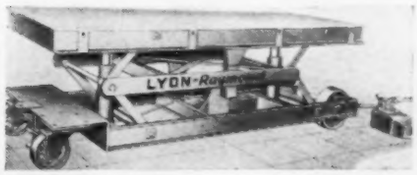


Multi-Spindle Drillers, Tappers Employ Hydraulic-Feed Systems

National Automatic Tool Co., Richmond, Ind., offers the Models C2B, C3B, and C4B, illustrated, Holesteel adjustable multi-spindle drillers and tappers. The machines are equipped with electrically controlled hydraulic feed systems, providing an infinite feed range and pick-off type change gears to permit a wide selection of spindle speeds.

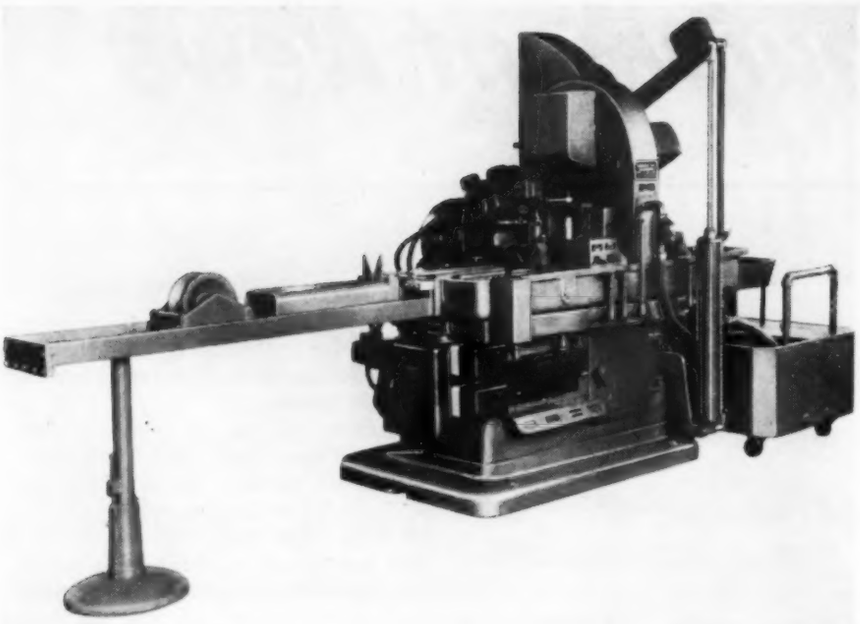
Each model can be supplied with either of two bases, which are similar except for size. Models C2B and C3B machines can be supplied with an adjustable knee-type worktable. The working area of the table top is surrounded by a wide coolant channel which drains to the machine base. The assembly has a vertical adjustment of approximately 12 in. The adjustable-spindle heads are of anti-friction mount construction, in which each spindle drive has independent spindle-speed change gears, which provide high, low and neutral changes.

Adjustable spindles can be located in any position within the area of the head and a drive angle of 35° or less. A tapping attachment can be added, consisting of a manual head-feed arrangement which works in conjunction with an electrical reversing control to the head motor. A step-drilling attachment can be furnished allowing drilling of deep holes by increments of depth with an automatic cycle. A remote control for setup use also can be supplied.



Redesigned Sheet-Feeding Table Offered in 10,000-lb. Capacity

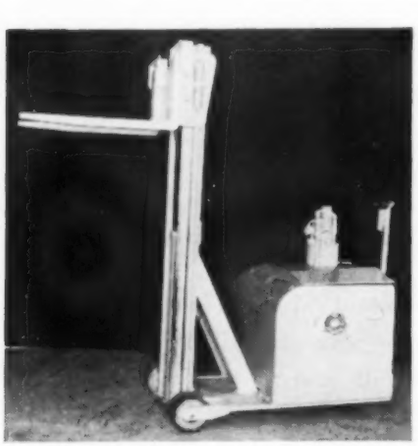
An improved design of their standard 10,000-lb. capacity portable hydraulic sheet-feeding table is announced by Lyon-Raymond Corp., 5518 Madison St., Greene, N. Y. Table is the double-cylinder type, using two vertical hydraulic cylinders which are synchronized by a toggle arrangement. The table top remains level at all times even under off-center loads. The platform is 36x96 in. Elevation is 12 in.



Automatic Abrasive-Cutting Machine Incorporates an Oscillating Head

The Model 470 automatic abrasive-cutting machine, offered by Andrew C. Campbell Div., American Chain & Cable Co., Inc., Bridgeport 2, Conn., features an oscillating head. The machine is sequence timed, eliminating adjustment of the timing cycle. The Model 470 will cut materials up to 6-in. dia. solid stock.

Every operation, including stock feed, clamping, adjustment for wheel wear, ejection of cut pieces, and stop after final cut, is completely automatic. Cycle includes the following steps: wheel cuts through work while feed carriage is being returned to left-hand or starting position; after cut, wheel is raised to "up" position; work clamps are raised as clamp of feed carriage is moved to right against its stop; bar clamp is released as work clamp moves downward and clamps bar into V block; wheel is positioned, cycle repeats.

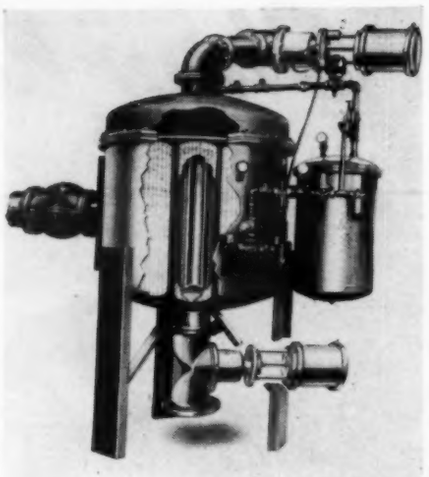


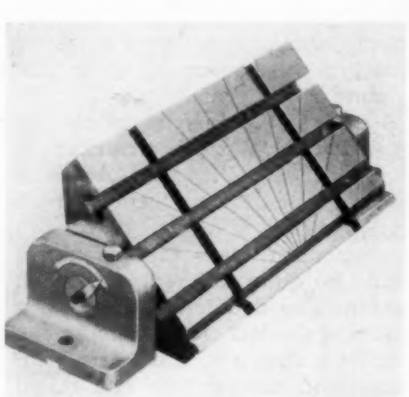
Hand-Operated Type Walkie Truck Handles 2500 lb., Is Motorized

The redesigned 2500-lb. capacity 12-v. Hi-Lift counterbalance motorized hand-operated Walkie truck is marketed by Moto-Truc Co., 1953 E. 59th St., Cleveland, Ohio. The truck is built in three types: a 66-in. non-tilting, 66-in. with tilting mast, and 80-in. telescopic with tilting mast, 20° backward and 2° forward in collapsed position. The width of the chassis is 36 in., adjustable fork spread is 32 in., length of forks, 30 in., and over-all length, 88 in. Control handle gives two forward and two reverse speeds. Forks are push-button controlled.

Honan-Crane Automatic Clarifier Provides Supply of Clean Coolant

Honan-Crane Corp., 609 Sixth St., Lebanon, Ind., offers an automatic clarifier said to increase tool life, eliminate individual pumps and motors, and give a better finish with fewer rejects. The clarifier removes abrasives, dirt and other contamination from water-soluble coolants used in grinders, broaches, boring machines, milling machines, rolling mills, and other metal-working tools. Coolant is filtered under pressure through mesh screens. Clarifier is said to remove particles as small as 5 to 10 microns. Seven sizes are available, ranging from a single-tube model with a flow rate of 5 to 15 gpm., to one with 37 tubes and a flow rate of 1,000 to 12,000 gpm. Over-all lengths range from 4 ft. 11 in. to 5 ft.; over-all widths from 1 2/3 ft. to 5 ft.; and over-all heights from 56 to 120 in. An electronic timer actuates the blow-down mechanism.





Malnar Universal Worktable Allows Tilting of Work to 45°

Malnar Machine & Tool Co., Inc., 19301 St., Dept. AM-10, Cleveland 10, Ohio, offers a universal worktable which fastens to any milling machine. The worktable is 16⅞ by 9⅛ in., and enables the operator to tilt work from 0 to 45° in either direction and lock it at the desired angle. Calibrations on a dial at the end of the table allow the operator to change the position of work and to return it accurately, or to select a new position without removing the work from the table.

When PRODUCTION is first consideration

LODGE & SHIPLEY DUOMATICS rank first.....

Quality tools to withstand the terrific wear of oil field work are the product of the Reed Roller Bit Co., Houston, Texas. And to machine thousands of cross lugs for Reed Rock Bits (drilling tools) this manufacturer installed a line of Lodge & Shipley 3-A Duomatics (automatic lathes). To hold up under the gruelling conditions encountered in the field, these parts, are forged steel of maximum toughness. Machining them is a challenge to any lathe . . the Duomatics turn them out in an endless stream . . . automatically. Operators just load rough parts, pull the lever, then unload the machined parts.

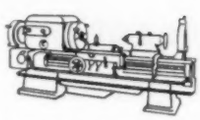
There are two Duomatic models, the 3-A for larger parts and the 2-A for smaller parts. Each is like two lathes in one. Twin tool carriages, front and back, operate singly or together, making any combination of straight and angular turning and facing cuts. Many users find, in actual production, that one operator with a Duomatic can out-produce several older or conventional lathes. Frequently one operator can easily handle two Duomatics.

If you have job repetitive lathe work . . . 50 parts, 500 parts or more . . . you will find many advantages in a Duomatic. Lodge & Shipley Engineers will gladly show you production figures or demonstrate with your own parts on a Duomatic.

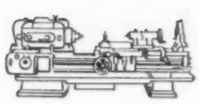
Write for Bulletin No. 634 for 3-A Duomatics and Bulletin No. 635 for 2-A Duomatics.

The Lodge & Shipley Duomatic is "like a lathe with a man inside"... so completely automatic that even unskilled operators quickly attain maximum production of highest quality lathe work. In changing from one job to another, simple adjustments eliminate complicated and expensive cam changes. Illustrated above is the 2-A Duomatic for the small job.

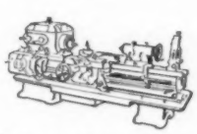
The machine shop of the Reed Roller Bit Co. presents the latest in tooling and layout. Shown here is a line of Lodge & Shipley Duomatic Lathes served by roller conveyors.



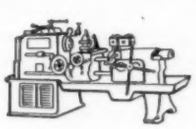
Oil Country Lathes



Manufacturing and Gap Lathes



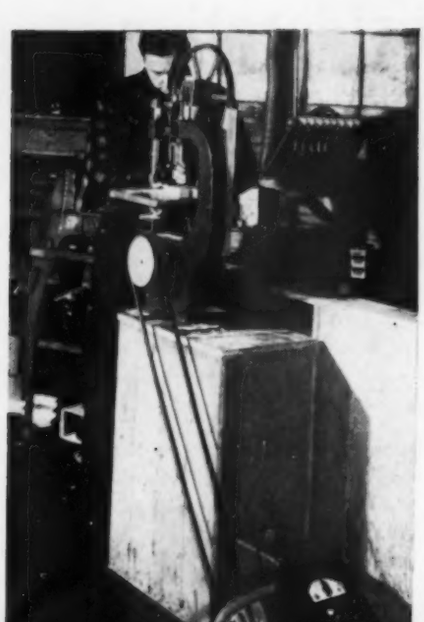
Engine and Toolmaker Lathes



Lodge & Shipley Acme Turret Lathes

THE **Lodge & Shipley** COMPANY

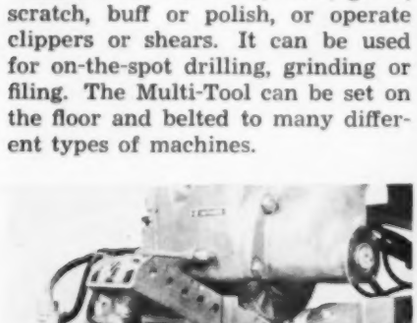
MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



Light, Portable Multi-Tool Bores, Sands, Grinds, Buffs

Continental Motors Corp., Detroit, Mich., introduces the Multi-Tool, a light, portable power source with any speed from 1600 to 2600 rpm. Built-in speed control maintains speed regardless of load, once the control dial has been set. Power is delivered either direct from the main shaft or through an automatic transmission which is part of the optional equipment.

Multi-Tool will bore, sand, grind, scratch, buff or polish, or operate clippers or shears. It can be used for on-the-spot drilling, grinding or filing. The Multi-Tool can be set on the floor and belted to many different types of machines.



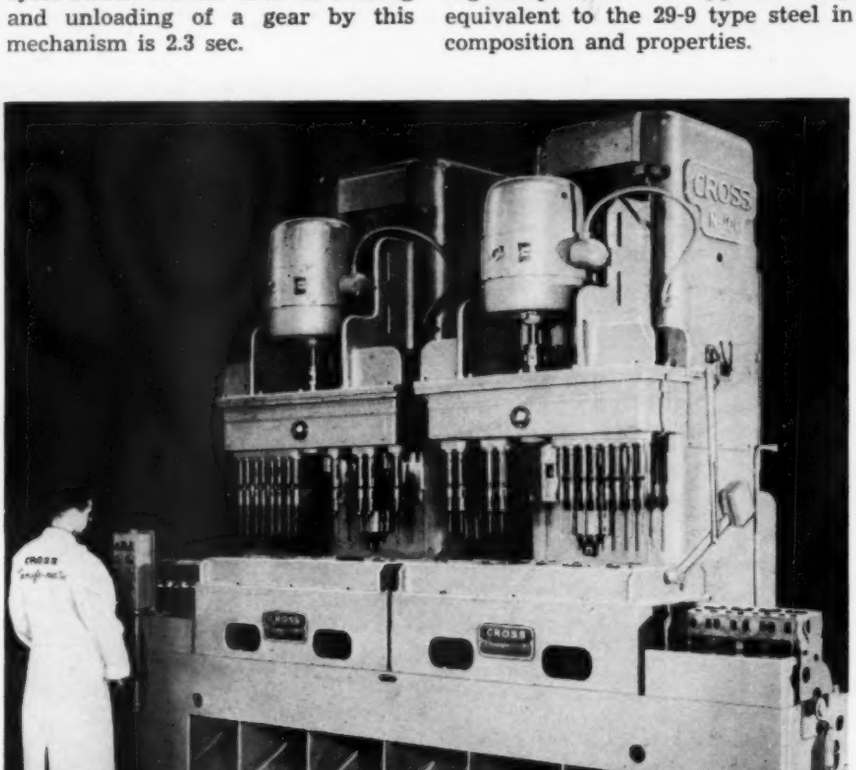
Automatic Loader for Gear Shaving On Red Ring Diagonal Machines

An automatic loading mechanism for use with Red Ring Diagonal gear shaving machines, Models GCV and GCU, is offered by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. The machines are able to run continuously as long as magazines are supplied with work gears.

At the beginning of the cycle, the head and tailstocks are in a retracted position. The loader with a work gear moves toward the cutter and meshes the work gear with the cutter. Head and tailstocks advance and clamp it in shaving position. Loader moves back, picks up another work gear and shaving begins. When shaving is completed, head and tailstocks retract allowing the shaved gear to drop on to the unloading rails which carry it out of the machine by gravity, after which a new cycle starts. Actual time for loading and unloading of a gear by this mechanism is 2.3 sec.

Electrodes for Stainless Steel Come with dc., ac.-dc. Coating

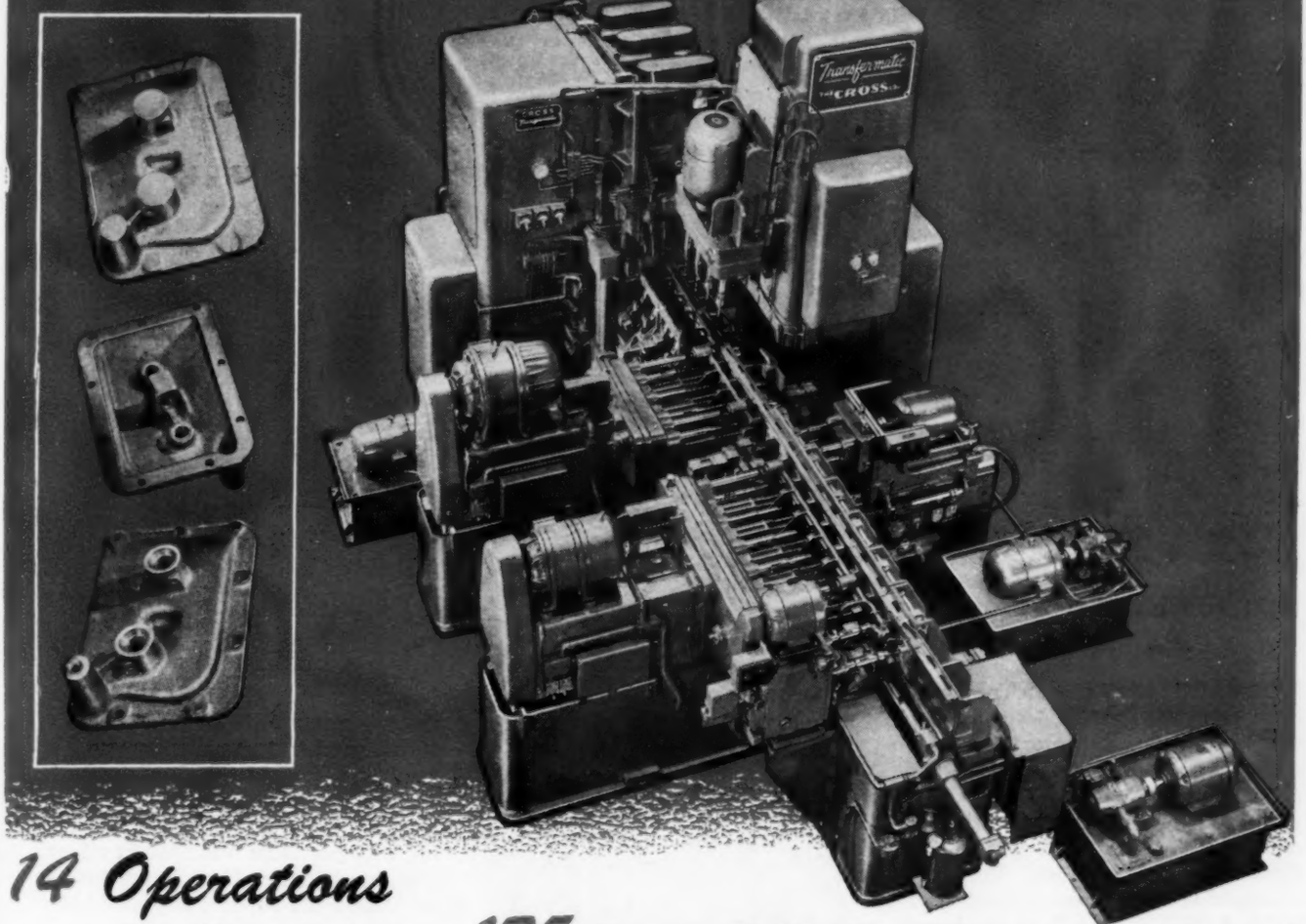
The McKay Co., Pittsburgh 22, Pa., offers electrodes 29.9 and 29-9Mo for stainless-steel welding. Electrodes are available with either dc. or ac.-dc. coating. The normal operating currents are slightly higher than those used with ordinary stainless-steel electrodes. Proper balance of the alloying and coating elements is said to allow the disposition of ductile, high-strength, crack-resistant weld metal. The combination of the heat-resistance and the high physical properties of the weld metal makes the electrode suitable for joining alloys that are approximately equivalent to the 29-9 type steel in composition and properties.



Transfer-matic Machine by Cross Combines 4 Finishing Operations

A special machine combining four finishing operations on automotive-cylinder blocks is built by The Cross Co., Detroit, Mich. Part of the Transfer-matic line which incorporates a continuous automatic materials-handling device, the machine cuts four cylinder blocks at one time progressively. At the first station, eight valve guide bushings are rough reamed; at two, four exhaust-valve insert parts are counterbored; at three, four intake-valve seats are formed; at four, the eight valve guide bushings are finish-reamed. A total of 64 pieces per hr. are said to be finished at 80% efficiency.

Another Transfer-matic by Cross



14 Operations

Performed on *175* Gear Shift Housings per Hour!

After one of the "Big Three" automotive companies "consulted Cross to cut costs" we designed and built this special Transfer-matic to machine transmission gear shift housings. Attended by only one operator, it simultaneously performs 14 operations on a total of 28 parts to produce 175 housings per hour at 80 per cent efficiency. The operator merely presses the control button and the machine does the rest—even automatically moving the parts from station to station.

This Transfer-matic is another example of Cross originality in creating special machine tools to achieve the utmost in profitable productivity.

PART: Transmission Gear Shift Housing.
OPERATIONS: 14 progressive operations to machine housing completely except for joint face.
PRODUCTION: 175 pieces per hour at 80% efficiency with one operator.
EQUIPMENT: Cross Special Transfer-matic.
FEATURES: ☆ Minimum physical and mental effort required from operator ☆ 28 pieces machined at one time progressively ☆ Parts are transferred, located, clamped and machined two at a time—all automatically ☆ Chips are conveyed to outside of machine ☆ Complete automatic lubrication with each machine cycle ☆ Reasonable flexibility for part design change through use of standard Cross units ☆ Low maintenance because of many standardized parts, easy accessibility of wearing parts, and interchangeability of self-contained units.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

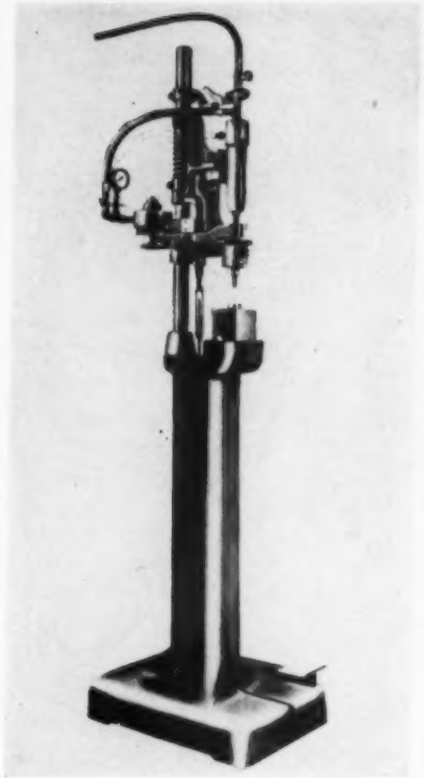
THE CROSS COMPANY

Established 1898

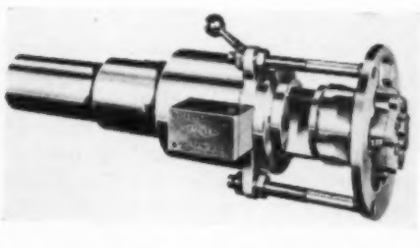
SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN



PNEUMATIC riveting machine combines hammer action with rotation supplied by an air motor which operates off both line pressure and exhaust air from the four interchangeable-capacity heads. The machine is made by Schlack Mfg. Co., 13255 Birwood, Detroit 4, Mich. The interchangeable heads have capacities of 3/32, 5/32/, ¼, and 5/16 in., based on mild-steel rivets, and produce 4,000 to 10,000 short-stroke blows per min. Air consumption of heads is 5-9 cfm. at 80 psi., and air pressure required is 30-80 psi.



Receding-Chaser Collapsible Tap By Landis, Taps Tapered Threads

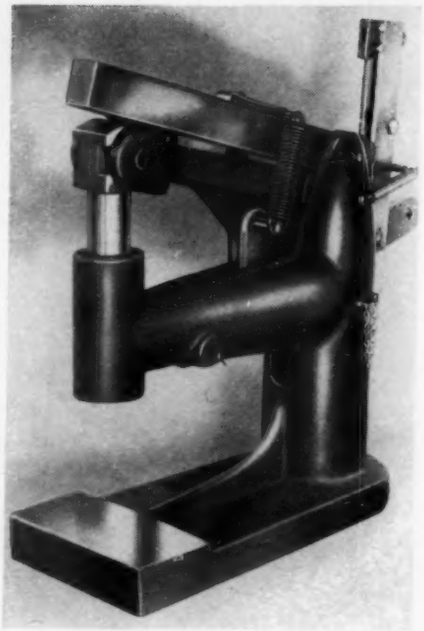
Style LL receding-chaser collapsible tap for tapping tapered threads, is offered by The Landis Machine Co., Waynesboro, Pa. The tap is adjustable for thread length and can be used for American Tapered Pipe Threads or for any line pipe, tubing, casing, or drill-pipe threads, listed in the A.P.I. Standards, providing that these threads are within the diametrical capacity of the taps.

The receding action of the chasers is accomplished through a fulcrumed-lever principle. The collapsing action of the taps causes the taper to drop into the tap head at the completion of the thread. Chasers recede into the tap head at a rate equal to the taper being produced. A detachable head permits the use of tap heads of various sizes and capacities on the same tap body. The Style LI taps can be used as stationary or rotary taps and can be converted from one type to the other. Tap body is made in four sizes to cover a range of nominal pipe sizes from 1 to 12 in.

Continuous Wheelabrator Tumblast Blast Cleans for High-Production

A continuous Wheelabrator Tumblast, for high-production blast cleaning, combines tumbling and longitudinal travel of the work. Made by American Wheelabrator & Equipment Corp., Mishawaka, Ind., parts are fed into and discharged from the machine in a continuous flow.

Work to be cleaned is carried through the blast barrel on an endless apron-type conveyor which tumbles and cascades the pieces thus exposing all surfaces to the abrasive blast from the overhead Wheelabrator unit. Rate of progression through the cleaning chamber is regulated by tilting the mill to proper angle using jack screws.



Automatic Staking Machine Holds Work by Pressure Pad

The high-speed automatic staking machine is offered by The High Speed Hammer Co., Inc., 313 Norton St., Rochester 5, N. Y. The machine is designed for staking or riveting fixed or movable joints and is adaptable to such operations as eyeletting, inserting, burring, and pointing with platinum, tungsten or silver. The trip-hammer blow is adjustable for the proper amount of pound blow required. Four models are available in either manual or motor-driven types. Capacities based on the use of solid mild-steel rivets range from 1/64-1/32 on the No. 0 to 5/64-3/16 in. on the No. 2. Strokes range from ⅞ to 3 in.; maximum die space ranges from 1⅜ to 4 in.

TWO SOLDERING GUN models are offered by The Weller Mfg. Co., Easton, Pa. Models are designed for use on 110 or 220 v. at 50 or 60 cycles, principally intended to meet requirements of export customers. Both models provide single heat at 100 watts with a 4-in. reach from housing to tip

J&L COLD-FINISHED
JALCASE

—the Original, Open-Hearth, Free-Machining Steel

J&L STEEL

—best in
MACHINABILITY

—best in
PHYSICAL PROPERTIES

—best for
HEAT TREATING
(*Induction or Conventional*)

There's more than a quarter of a century of research and experience behind every ton of J&L JALCASE Steel!

Cold-finished JALCASE—the forerunner of *all* free-machining, open-hearth steels—was originated in the J&L Metallurgical Laboratories more than a quarter of a century ago as a practical solution to the problem of machinability. This development resulted in an open-hearth steel with cutting and machining qualities closely approaching those of Bessemer steels.

Acclaimed, from the very beginning, for its outstanding properties, JALCASE *still is the outstanding steel in its class today!* Its performance is unsurpassed when compared with that of similar steels.

JALCASE is available in many grades, each of which is applied to suit the application. Typical JALCASE analyses are found in the A.I.S.I. 1100 series wherein the manganese content is 1.00% to 1.65%, such as in Grades C-1117 through C-1144.

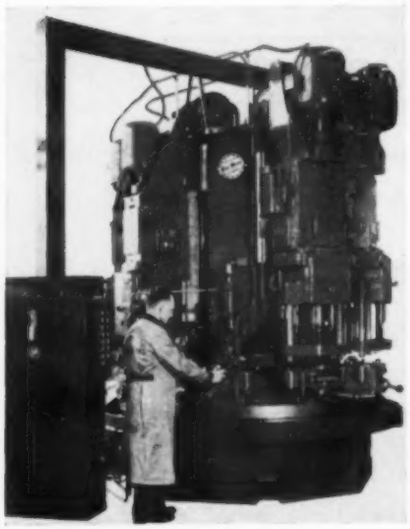
JALCASE is supplied as cold-drawn or cold-drawn-with-metallurgical-processing such as special and varied tempering treatments. These thermal treatments are designed to improve physical properties, machinability, provide minimum distortion and increase wear resistance. Thus, many parts made of this material may need no further heat treatment after machining.

Let us send you complete information on JALCASE—the *modern* free-cutting steel. Write to: Jones & Laughlin Steel Corporation, 402 Jones & Laughlin Building, Pittsburgh 30, Pa.

JONES & LAUGHLIN STEEL CORPORATION

AMERICA'S FOREMOST PRODUCER OF FREE-CUTTING, QUALITY STEELS

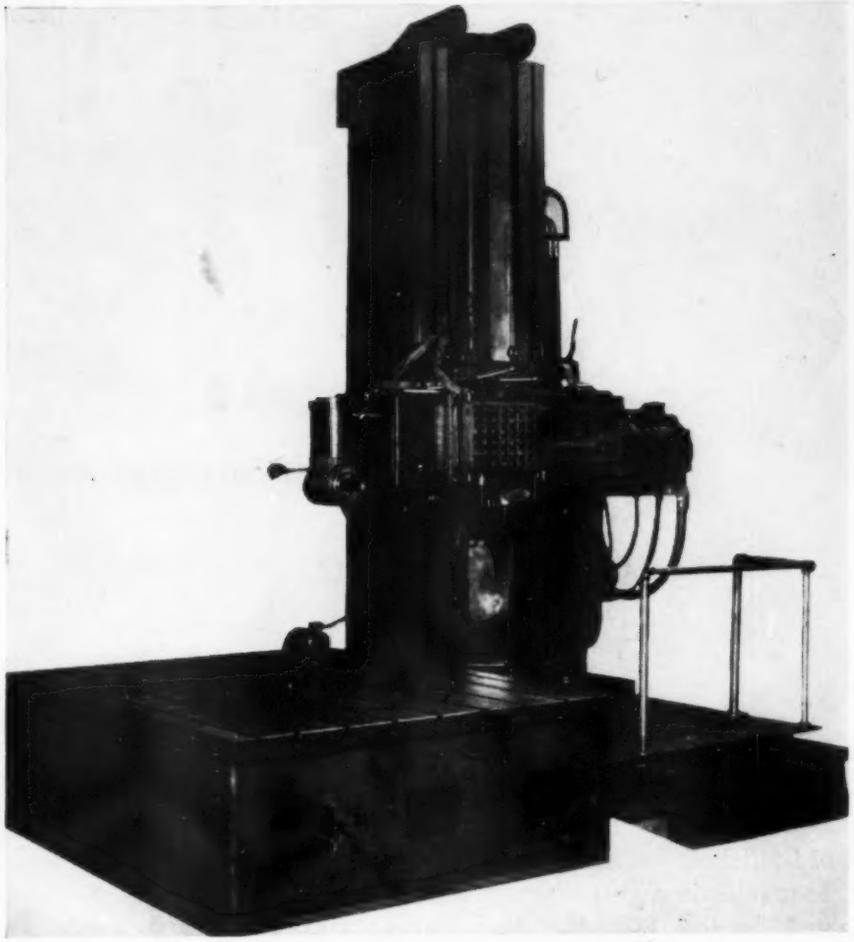
SUPERFICIAL HARDNESS TESTER, for Rockwell testing, is offered by Clark Instrument, Inc., 10200 Ford Rd., Dearborn, Mich. It is designed for testing surfaces that must not be marred, even by standard Rockwell indentation. Depth of penetration is held to limits of 0.005 in. or less. The instrument is particularly suitable for surface-hardened steel, exceptionally thin metals, rolled sheet metal, or very small areas. It is available with 8-, 12-, or 16-in. vertical capacity



MULTIPLE-OPERATION 8-station indexing-type machine is added to the Rotomatic line manufactured by Davis & Thompson Co., Milwaukee, Wis. Listed as Model VSI, the machine illustrated drills, reams, and chamfers a 1.281-in. hole and saws slots in both ends of front-suspension spindle-support arms. Work circle of this machine is 80 in. with an 88-in. dia. table

Die-Cut Profile Name Plates Stamped from Stainless Steel

Dayton Rogers Mfg. Co., Minneapolis, Minn., offers a process for obtaining a limited number of die-cut profile custom-made nameplates for industrial equipment without the usual die cost. Nameplates can be produced in any size or style. The maximum over-all length is 36 in., with a letter height up to 3 in. They can be made of cold-rolled strip steel with a chrome-polish finish, stainless steel, sheet brass, sheet copper, zinc, and in some cases sheet synthetic-plastic material. Blanking and piercing dies for these die-cut signs are said to cost about 20% of the cost of conventional-type dies.

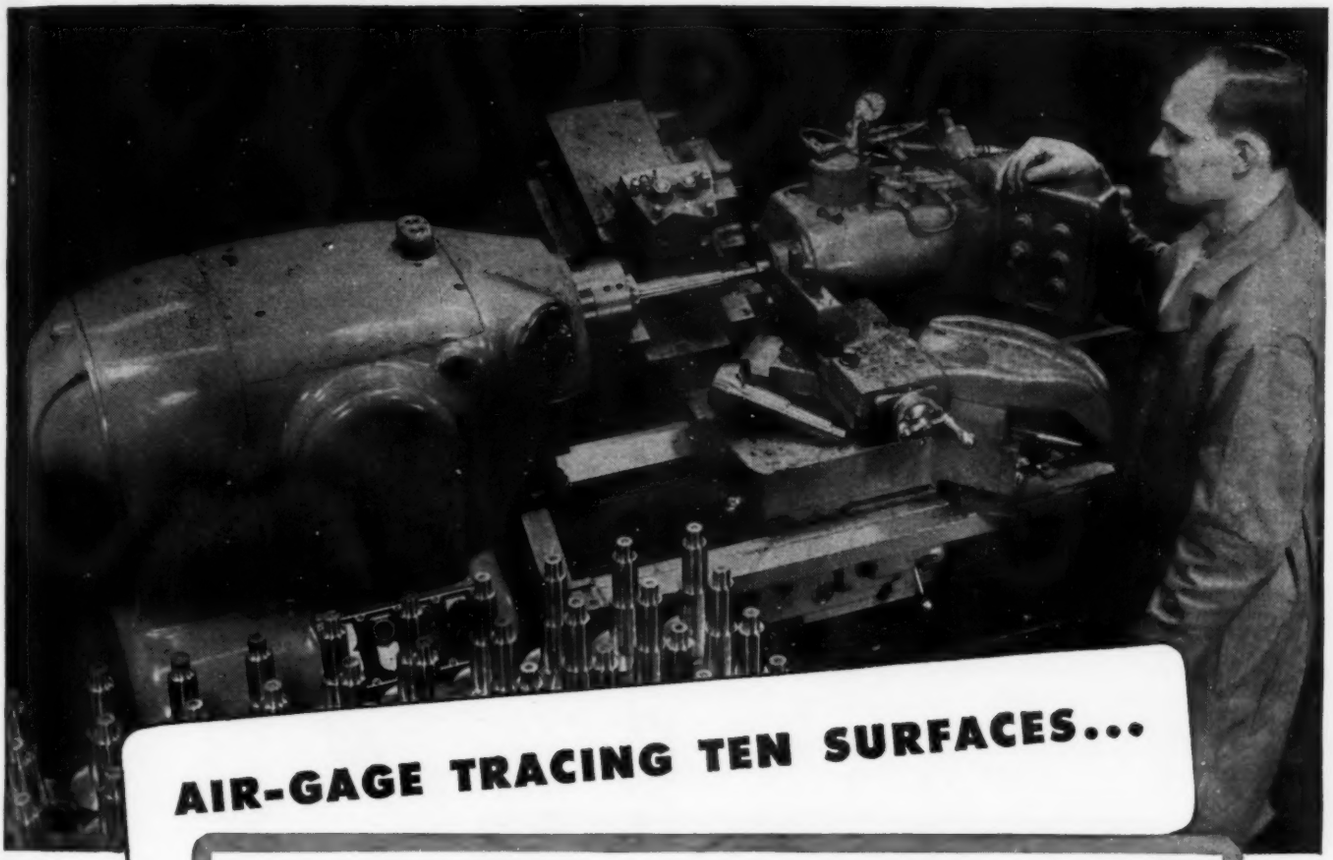


Miller For Punch-Press Frames Operates Electro-Hydraulically

An electro-hydraulically operated floor-type milling machine for punch-press frames is introduced by Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio. The bolster seat, slides, gib pads, and crankshaft cap seat of a 60T O.B.I. frame can be machined in one setting. Carbide milling cutters are used in all operations.

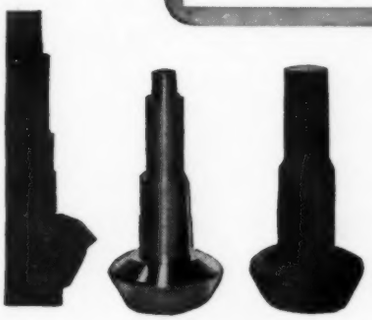
Machine consists of a heavy column and runway, spindle-head slide, spindle-carrier head, and fixed table. The column is guided on the runway by a narrow guide with taper gibs and square locks. It has milling feeds and rapid traverse by hydraulic power. It is clamped to the runway by a pushbutton controlled torque motor. Spindle-head slide travel is 20 in., spindle-head-unit vertical travel is 63 in., and distance between spindle noses 20 21/32 in.

The hydraulic system consists of a 3-hp. power pack mounted on column, providing continuous variable feeds ranging from 1 to 15 ipm., and power traverse of 90 ipm., to slide, spindle-head unit on column and column unit on runway.



AIR-GAGE TRACING TEN SURFACES...

MONA-MATIC MACHINING TIME... *72 seconds per piece*



Template (at left) controls the Air-Gage Tracer mechanism to make a continuous single-point cut on the rough forging (at right) producing a finished bevel gear blank (center) in two operations. Tolerance: .005".

The unbeatable combination that makes this production possible is the Monarch Mona-Matic, equipped with rear tool slide and the Monarch Air-Gage Tracer.

The machining cycle is fully automatic. One operator can service a battery of two Mona-Matics, *easily*, thereby doubling his output per machine. While the single-point Air-Gage Tracer-controlled tool on the front slide makes a continuous cut to finish the principal diameters, the rear slide traverses in to perform the necking, grooving and forming cuts. That way no time is lost in needless second operations—and there are a minimum of cutting tools to synchronize or resharpen.

The end result is more production—and finer finishes—at less cost. In other words, to use Monarch's oft-quoted maxim, "*Peak Production at a Profit*". May we show you how the Monarch Mona-Matic with Air-Gage Tracer can make that statement more than just a slogan—in your shop?

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

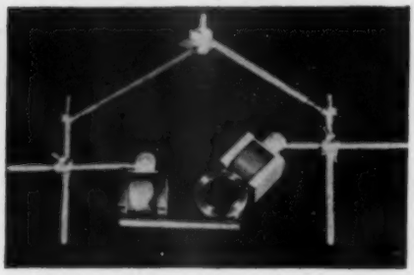
ACCURACY - ECONOMY - LONG LIFE

Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER* —— TURN TO MONARCH

Steel Stamp Holder by Acme Marks Short-Production Runs

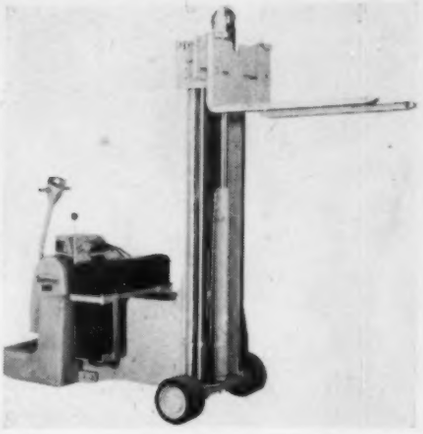
A steel stamp holder for marking parts where it is undesirable to stock a quantity of different stamps or where information to be stamped may be altered from time to time is offered by Acme Marking Equipment Co., 8030 Lyndon, Detroit 21, Mich. It is available for hand use, and can be had with a press shank for machine operation. The stamp comes in a complete kit with a choice of figures only, letters only, or a combination of both. The holder is available in a complete range of sizes with slot lengths of 1, 1¼, 1½, or 2 in. Type sizes accommodated are from 1/16 to ⅜ in. high.



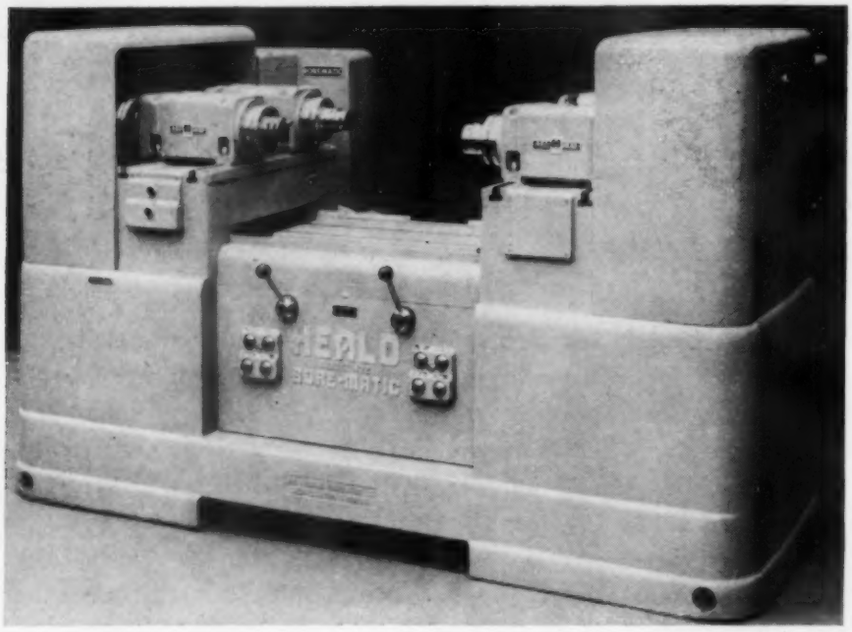
Magnetic Welding Positioner Includes V-Frame, Two Magnets

The Minute Man Magnetic welding positioner consisting of a V-frame equipped with two powerful permanent Alnico magnets, is marketed by du Mont Corp., Greenfield, Mass. Two or more pieces of ferrous metal are gripped and held in almost any position for welding, soldering, or other joining operations. Magnets have equal holding power on all four sides.

The frame has two horizontal arms, 10 in. long, and two vertical arms, 6 in. long. Distance between arms and height on vertical arms are variable. Frame has a spread of 18 in. The positioner can be used for brazing non-ferrous materials by using C-clamps which are in turn gripped by the magnets.



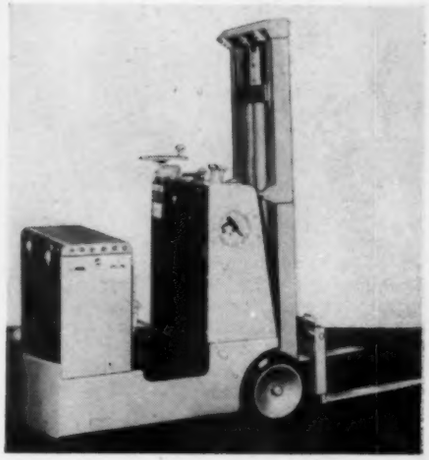
SUSPENDED-fork model Transtacker has been announced by Automatic Transportation Co., 149 W. 87th St., Chicago, Ill. An automatic tilt at carrying position is included as standard equipment. Transtacker capacities 2500 lb. for a 36-in. load or 2000 lb. for a 48-in. load. Lifting height of forks is 64 in. and the over-all height is 79 in. The model is priced at $1800



Heald Offers Two Bore-Matics One Single-End, One Double-End

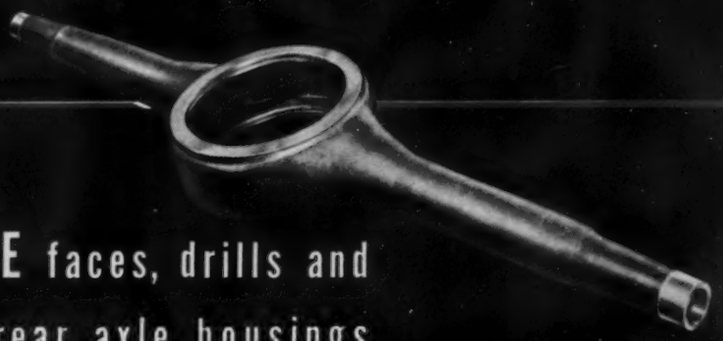
Heald Machine Co., Worcester 6, Mass., announces the addition of two Bore-Matics, Models 421 and 422, for handling heavy work without special out-size equipment. Machines are capable of performing boring, turning, chamfering, grooving, facing or flycutting operations separately or in any combination.

The single-end Model 421 and the double-end, Model 422, illustrated, have up to 10 hp. available at each end of the machine providing maximum power for heavy roughing cuts and higher speeds when using multiple heads. A constant-pressure dump valve automatically furnishes the amount of oil required during each phase of the machine cycle. Maximum table travel for both models is 20 in. Table feeds in the fast range for "in" feed is ½ to 50 ipm.; for the slow range for both feeds, ½ to 40 ipm.

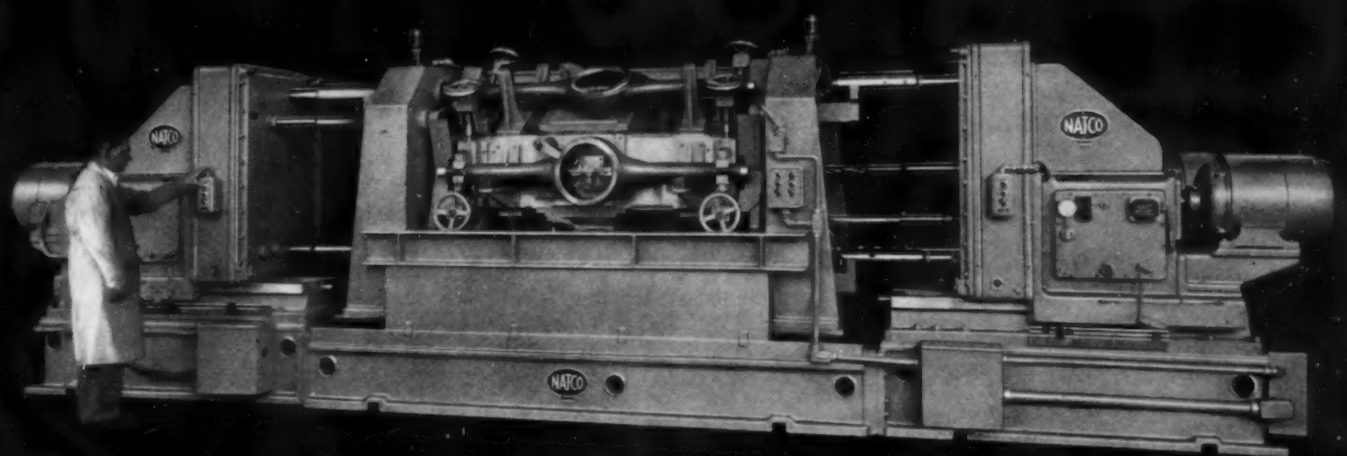


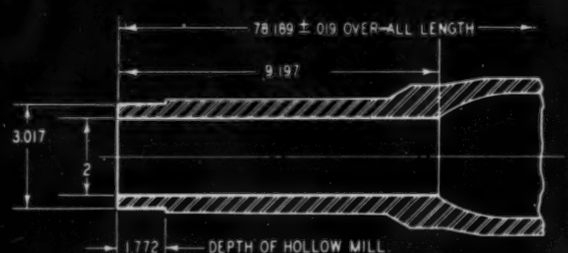
ELECTRIC fork truck with a 1000-lb. capacity is offered by Lewis-Shepard Products Inc., 278 Walnut St., Watertown 72, Mass. Part of the Standrive line, the model is available in both telescopic and non-telescopic models. It is designed for use where greater-capacity machines are not required. The truck will carry full 48-in. long loads of maximum capacity

75 rear axle housings per hour



NATCO HOLEUNIT MACHINE faces, drills and hollow mills both ends of rear axle housings





SECTION OF ONE END OF REAR AXLE HOUSING SHOWING DIMENSIONS OF FINISHED HOLE, AS FACED CORE DRILLED AND HOLLOW MILLED

POSITION 1 Remove and load one part.
POSITION 2 Front Right and Left Hand Heads — Face both ends.
POSITION 3 Rear Right and Left Hand Heads — Core drill holes ⅓ depth.
POSITION 4 Rear Right and Left Hand Heads — Core drill holes ⅔ depth.
POSITION 5 Rear Right and Left Hand Heads — Core drill holes through.
POSITION 6 Front Right and Left Hand Heads — Hollow mill both ends to depth.

This NATCO two-way, four-headed, horizontal drilling machine with hydraulic feed combines multiplicity of operation and high production. The machine consists of four E21 HOLEUNITS and a total of ten spindles. A NATCO six position trunnion-type fixture accommodates one rear axle housing in each position while performing the operations outlined under the drawing at the left. The part is located by equalizing at each end and in the banjo housing. Production, including facing, step core drilling and hollow milling both ends of each axle housing, is 75 parts per hour.

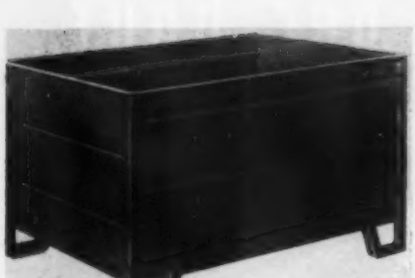
NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

NATCO

Call a Natco Field Engineer

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City



CORRUGATED BOX with legs for moving or storing heavy metal parts, is made by Palmer-Shile Co., 16019 Fullerton Ave., Detroit 27, Mich. Legs are designed to permit complete accessibility with fork or power-lift truck. Box is made in any size or load capacity to meet specifications

BALANCER, for suspending portable tools in shop or production-line work, is made by The Aro Equipment Corp., Bryan, Ohio. The Model 7072 balancer can be adjusted for balance on all types of portable tools weighing up to 10 lb. A cable comes out of the bottom of the balancer, in line with the suspension eye. Standard equipment includes 6 ft. of preformed wire cable, rubber bumper, and cable clamp for adjustments at any level

Machinist's General-Purpose File Roughs, Finishes Varied Metals

The Machinist's general-purpose file is marketed by Nicholson File Co., Providence, R. I. The file is designed for use on aluminum, bronze, cast iron, malleable iron, mild steel and annealed tool steel. The single tool can rough and finish various metals. It has single cut teeth, comparable to those of a regular mill bastard, divided by angular serrations into shorter cutting edges which remove stock rapidly, leaving a smooth finish. Files are available in lengths of 8, 10, 12, and 14 in., in one degree of coarseness only, and taper in width but not in thickness.

SAPPHIRE GAGE, the Tipt-Type, is made by Sapphire Products Div., Elgin National Watch Co., Aurora, Ill. It has approximately ¼-in. sapphire tip metallically bonded to the leading end of the steel member

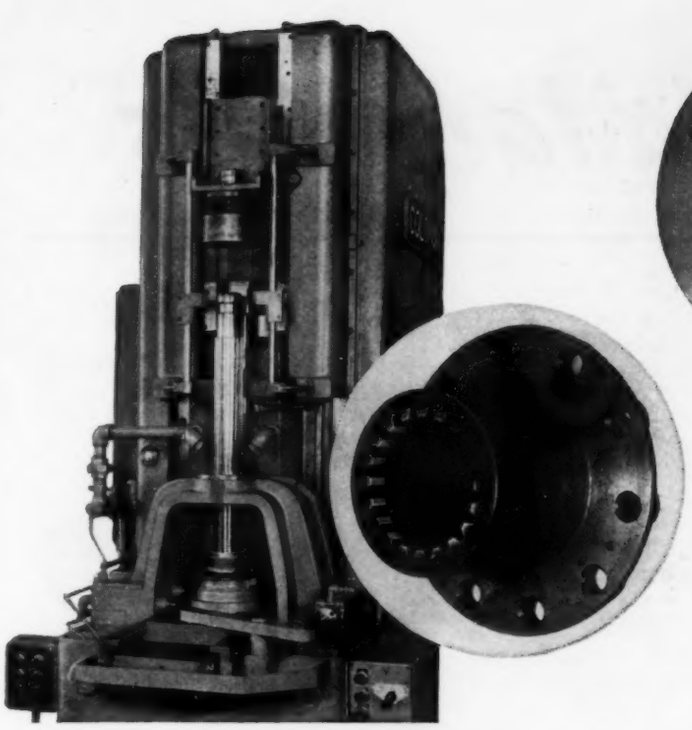
Snyder Special Automatic Machine Inserts Rivets in Wheel Assembly

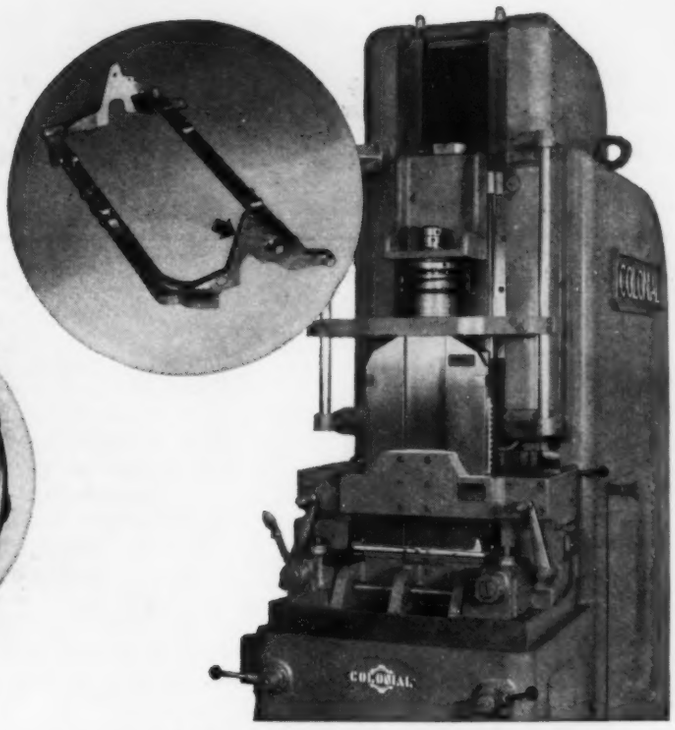
A special machine built by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich., automatically inserts 12 rivets in an automotive-wheel assembly. The wheel assembly is located on the fixture and thereafter the operation is entirely automatic. Six automatic-feed hoppers are provided which feed the rivets down to the wheel assembly where hydraulically actuated plungers pick the rivets out of the hopper chutes and carry them into the pierced rivet hole in the wheel assembly. Six rivets are inserted simultaneously. Assembly is then automatically indexed 180° and six more rivets are inserted. Production is 200 wheel assemblies per hr. at 80% efficiency. Floor space required is approximately 45x57 in.

Welding- Cutting-Torch Head Revolves Through a 180° Arc

A welding and cutting torch called Cristorch is offered by The Hamilton Tool Co., 9th St., at Hanover, Hamilton, Ohio. The flexible head can be revolved through an arc of 180°. The torch is said to cut metal of thicknesses from 1/32 to 4 in. It will cut holes and circles from ⅜ to 30 in. dia., with an accuracy said to be within 1/64 in. It cuts countersunk holes and bevels one or both sides of a straight cut in a single operation. A side-opening tip lock-nut is also featured for decreasing time required for insertion or removal of tips.

LITHIUM-ATMOSPHERE pit-type furnace is offered by The Lithium Co., 111 Sylvan Ave., Newark 4, N. J., for controlling the heat treatment of such products as sheet metal, tubular shapes, bar stock, shafts, and other products. It is said to eliminate atmosphere variables that cause irregularities in carburizing or heat-treatment results. It is designed for heating operations up to 2000 F., for uniform heating under predetermined, automatically controlled conditions for carburizing, carbon restoration, annealing, neutral hardening, cycle annealing, normalizing and descaling





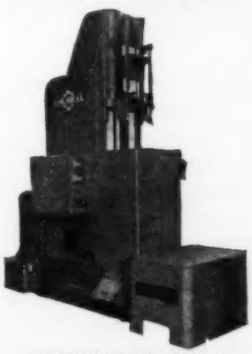
HEAVY STEEL WHEEL HUBS ---or--- LIGHT WEIGHT TYPEWRITERS

They're all the same to versatile high speed Colonial Broaching Machines

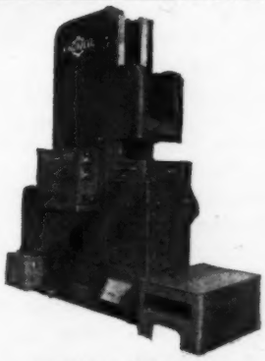
PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13
BEST BY TEST

Shown here are two Colonial Pull-down broaching machines. They're fundamentally alike, but one has the job of broaching 8-pitch splines in a forged steel wheel hub, while the other broaches the inside faces of lightweight aluminum typewriter carriage frames. Automatic broach handling, complete guiding of broaches above and below the part, and high accuracy are characteristic of both of these standard Colonial machines. Of course there is a difference in machine capacities. One is a six, the other a 15 tonner. We'll be glad to tell you whether production cost of your parts can be cut and output rate increased on one of these or other types of the latest Colonials.

Have you seen these new Colonials? Ask for Bulletins describing them!



INTERNAL BROACHING
PULL-DOWN
BULLETIN NO. RD-48



INTERNAL BROACHING
PULL-UP
BULLETIN NO. RU-48

SURFACE BROACHING
SINGLE-RAM
BULLETIN NO. RS-48

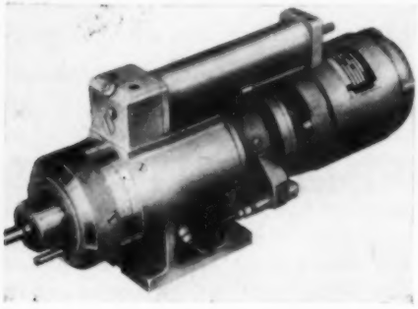
ALSO:

Colonial Dual-Ram surface broaching machines, Broaching Presses and Universal Horizontal Broaching Machines.

Parts and Materials

Wound-Rotor Induction-Type Motor Comes in Ratings of 1 to 15 hp.

A wound-rotor Life-Line induction motor featuring open drip-proof construction is offered from Westinghouse Electric Corp., Pittsburgh 30, Pa., in ratings of 1 to 15 hp. The frame is rolled from steel plate. The type CWP wound-rotor motors can be used wherever adjustable speed is required, or where high-starting torque with low-starting current is necessary. Motors are available for 60, 50, or 25 cycles, two and three phase, 208, 220, 440, and 550 v.; 1750, 1160, 870, 690, 580 rpm. for 60 cycle, 1450, 965, 715, 580, 485 for 50 cycle, 1450, 750, 485 for 25 cycle; 40 C. rise, continuous open-constant speed



Air-Hydraulic Type Power Unit For Drilling, Milling, Riveting

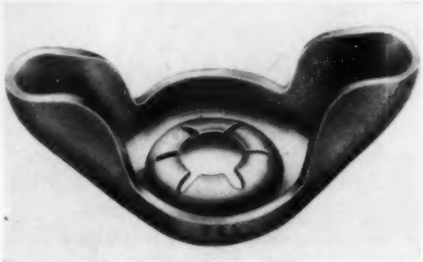
An air hydraulically operated power unit is marketed by Cleveland Republic Tool Corp., 1265 Union Commerce Bldg., Cleveland 14, Ohio, for production drilling in any position, angle, or plane. The drill unit, available in two models, can be used as a single unit or combined with several for simultaneous operations. The Model 250 can be used to drill ½ in. in steel, while the Model 500 is suitable for drilling ½ in. in steel. Models can be used for milling, riveting, chamfering, slot sawing, and spot facing as well as for drilling.

A rapid approach and variable feed allows the tool to come within 0.001 in. of the work, at which point the work feed automatically cuts in. Each drill unit also includes a micrometer adjustment and lock screw to control depth of drilling, countersinking, and chamfering to tolerances of less than 0.001 in.

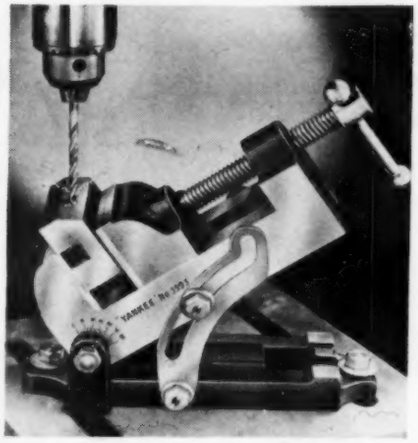
Quick-Acting Collet Chucks For South Bend, Other Lathes

The Goodwin Mfg. Co., 10 East Broadway, Cuyahoga Falls, Ohio, has developed a quick-acting collet chuck that can be used on South Bend, Logan, Atlas, and similar types of lathes. The chuck utilizes a multiple-leverage principle and cantilever action of hardened steel fingers, giving a vise-like grip on the material.

The control lever requires fingertip pressure for actuation. The quick release feature allows chucking of work while spindle is in motion. The chuck capacity permits the use of bar stock up to full diameter of spindle bore, and short pieces of even greater diameter can be handled. No pushtube or drawbar is required. Chucks are furnished in two sizes: a 1-in. capacity chuck fits lathes having 1½-in. 8-threaded nose spindle, and a 2-in. capacity model can be fitted to any lathe spindle up to 3⅜ in. in size.



SELF-LOCKING wing nut offered by The Palnut Co., 81 Cordier St., Irvington, N. J., employs the same type of thread engagement used in other Palnuts made by the company. The design is said to give vibration-proof qualities. The locking part is essentially a cone with a hole in the center, whose inner edge is slotted to form spring jaws which grip the screw thread when the Palnut is tightened



ANGLE VISES, with or without swivel bases, are offered by North Bros. Mfg. Co., Philadelphia, Pa., in two sizes. Part of the Yankee line, the vises can be used on the bench or on the machine. They are ground on both sides, front end and bottom for use on drill-presses, milling machines, and similar machinery. A 90° scale is stamped on the vise for setting at proper angle for work. The vise can be detached without disturbing the work by loosening one set screw

150 HOLES PER STROKE

Hundreds of smooth-operating Steelwelds are now in service performing a host of varied punching, bending and forming jobs. A complete line of machines is available for plate of all thicknesses to one inch or lengths to 20 feet.

Punching 150 holes ranging from .078 inch to .250 inch in size at one time, is a job easily done on Cleveland Steelwelds.

Clearance between punch and die illustrated, was held to .0015 inch to avoid burrs. The punches are individually gagged and gauged, with built-in strippers, set to accurate scale readings and as close as ¾-inch centers.

For supporting the sheets during punching, this machine is provided with a special table and micrometer gauge which is operated by a handle at front of press just below top of bed.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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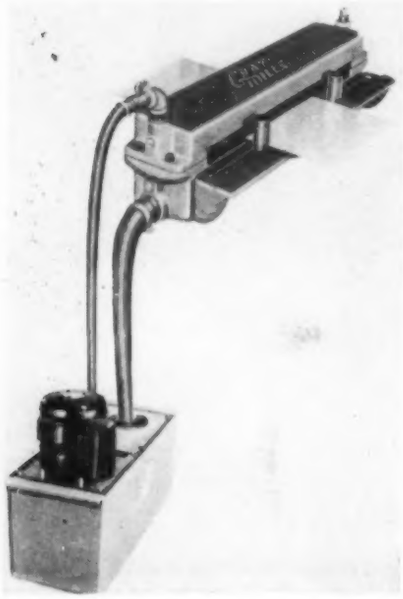
STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Bright-Annealed Cold-Rolled Steel Available in the 18-8 Analysis

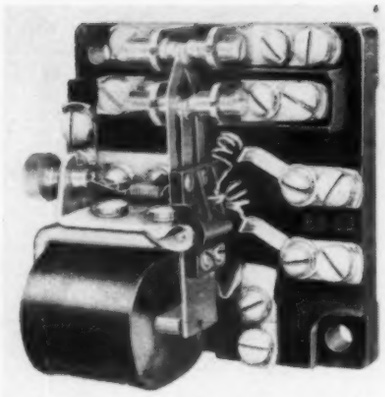
Bright-annealed cold-rolled strip is now available in the 18-8 analysis from The Cold Metal Products Co., Youngstown, Ohio. Chrome-nickel steels in dead-soft annealed temper can be furnished in a bright, mirror finish without expensive buffing or polishing. The bright finish is achieved by rolling with special tungsten-carbide rolls, and is retained during the annealing operation. The steel is offered in widths up to 7½ in., and in thicknesses 0.001 in. and heavier. It can be furnished in coils weighing to 300 lb. per in. of width and fractional-inch sizes can be bobbinwound.



Pressure-Feed Stock-Oiling Unit For Punch Presses, Is Automatic

An automatic pressure-feed stock-oiling unit for punch presses is offered by Graymills Corp., Evanston, Ill. It consists of a force-feed lubricator and a portable pumping unit. The unit can be used on roll-feed or strip-feed applications. The lubricant is pumped into the oiler where it sprays both the top and bottom surfaces of the stock as it passes through. Excess oil is squeezed off into the oiler and drained back into the pump reservoir. A series of baffles settle out solids before the oil is recirculated.

The oiler is made in three sizes to handle stock with maximum widths of 6, 12, and 24 in. and maximum thickness of 3/16 in. for all three models. The gear-type pump unit delivers up to 90 gph.



Allied Control's Type BK Relay Works Under Limited-Power Supply

Allied Control Co., Inc., Dept. S, 2 East End Ave., New York 23, N. Y., offers the Type BK relay for use under conditions of limited-power supply and also where precise operating characteristics are vital. It is designed for extra sensitivity and has molded-bakelite insulating parts throughout. The relay is supplied in one pole or two pole, normally open or normally closed contact arrangements. The Type BK has a dc. coil rating up to 32 v. at 24 milliwatts, and an ac. coil with a rating of 220 v. at 0.24 v. amp.

AhCOloid Emulsion Cleaner Offered for All Type Metals

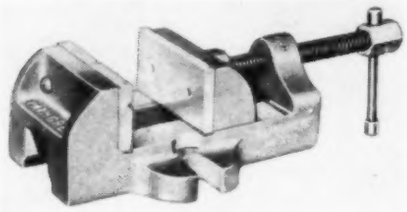
Apothecaries Hall Co., Waterbury 88, Conn., offers the AhCOloid emulsion cleaner, which can be used on all metals and is especially desirable for cleaning buffed zinc-base die castings or aluminum parts which would be stained by prolonged immersion in alkali cleaners. Solvent has a flash point of 100 F. It is used as received. No water or other solvents are added.

Federal XLS Series Ball Bearings Have Small Cross-Section Area

The Federal Bearings Co., Inc., Poughkeepsie, N. Y., offers the XLS bearing series produced in sizes from 1⅜- to 10-in. bores with outside diameters from 2 9/16 to 13¼ in. Bearings, fabricated from SAE 52100 steel, offer a cross-section area through any pair of races said to be about 68% of the area of a corresponding light series metric size bearing. The result of this makes bearings applicable to compact clutches, thin-walled housings, and wherever space is at a premium and weight saving important.

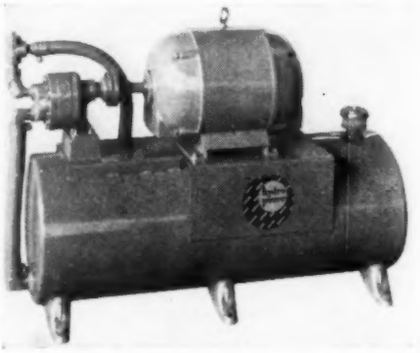
Polished Synthetic-Sapphire Balls Are Chemically Inert, Resist Heat

The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y., offers synthetic sapphire balls polished to a sphericity of less than 10/1,000,000 of an inch, unaffected by acids and with a hardness said to be second only to a diamond. Spheres have a low coefficient of friction, are chemically inert, and heat resistant.



Palmgren Drillpress Vise Has Removable Steel Jaws

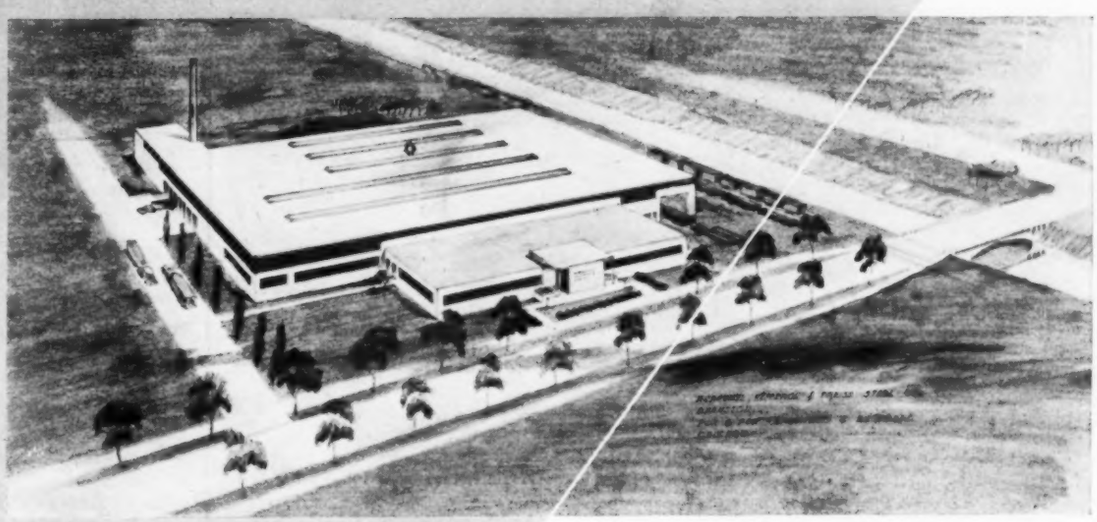
A 3-in. jaw drillpress vise is offered by Chicago Tool & Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill., as part of the Palmgren line of machine vises. The No. 320 vise has jaws 3 in. wide, which open 3 in. The steel jaws are removable. The vise is provided with side lugs for bolting to machine tables, and is recommended for use on drillpresses, milling machines, grinders, and other machines.



PACKAGED hydraulic power units are offered by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Called the Cubline, units are for application where forming, bending, straightening, pressing, lifting, pulling, and lowering are operating factors. Three capacities are available, 6, 10, and 15 gpm. Each unit consists of: a 35-gal. round oil-storage reservoir with foot mountings; electric motor; 1000-psi. Cubline gear pump; relief valve; coupling; pipe and fittings; suction hose and clamps

KHP *has a new home*

To maintain our long standing policy of service and quality, KHP has erected one of the finest and most up-to-date warehouses in the country. One hundred thousand square feet entirely under crane—railroad loading inside the plant—greatly increased facilities for slitting, shearing, roller leveling, edge rolling, all to serve you better.



Cold rolled and hot rolled strip—shim—sheet steels. Tempered and polished spring steel • Electrical sheets • Fine precision tubing—cold drawn seamless—welded—stainless and alloy • Tempered feeler gauge steel • Cold finished bars •

Aluminum strip—sheets and rod

Slitting up to and including $\frac{3}{16}$" thickness

Shearing up to and including $\frac{1}{4}$" on 12' square shears

Edge rolling all standard flat wire sizes

Roller leveling up to $\frac{1}{4}$" thickness

KORHUMEL • HEFFRON & PREISS STEEL CO.

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MINNEAPOLIS-ST. PAUL • MILWAUKEE KHP STEEL ST. LOUIS • LOS ANGELES • MT. VERNON, N. Y.

MICROHONE★

for 300% to 400% MORE production of pinion gears

★

HOW TO DO IT:

In order to cut the teeth concentric with the bore, the bore is first MICROHONED and size is held automatically to within .0003″. The blanks are pressed on an arbor and the teeth are cut. After heat treating, the bore is again MICROHONED to correct any distortion caused by heat treating and to generate any desired surface finish.

No pitch diameter wobble!

★Trademark Reg. U.S. Pat. Off.

MICROMATIC HONE CORPORATION
8100 Schoolcraft Avenue, Detroit 4, Michigan

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1323 S. Santa Fe, Los Angeles 21, California
616 Empire Bldg., 206 S. Main St., Rockford, Ill.
55 George St., Brantford, Ont., Canada
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.

ROUND TABLE Discussion

EXPERT OR EXECUTIVE?

This is the day of the specialist and a foreman cannot pitch in and tell a specialist his work without causing trouble. A good foreman would not necessarily make a good specialist. The qualifications for the two jobs are quite different.

A foreman who has specialist under him must of necessity know something of his work, but this should not cause him to interfere and he should be guided more by the results obtained than by the way the man seems to do the job. When a specialist is made a foreman, any interference on the old job is deeply resented by his successor.

Specialists do not like advice, even from other specialists, and as a rule, the more they can be left alone the better. A specialist's work is continually changing, and varies from factory to factory; therefore if a foreman interferes, he is verly likely to be wrong.

W. L. Warner
Essex, England

•

STEP DOWN OR STEP OUT

Many firms desire to make the man's declining years as free from anxiety as possible. Long service usually connotes satisfactory service, and the two present a situation which many firms have tried to meet by installing pension schemes, either of the contributory or non-contributory type. In these, length of service is a factor.

There are cases, however, where pension arrangements may not be sufficient, as in the case of a foreman who has had a long sickness. To ask such a man to step down and take an obviously junior job would be almost like hitting below the belt. In such circumstances, it is often practicable to make an arrangement which can work out to the advantage of both foreman and firm.

A foreman with many years of experience can often be useful in another sphere; not in a supervisory capacity, but rather in work of an advisory or investigating nature. This need not bring him into touch with his old department duties, or personnel, and there need be no obvious stepping down.

I remember one such case. An old inspection foreman was asked to in-

TURN OUT HIGH QUALITY BIG CASTINGS FASTER, EASIER

...WITH WICKES NO. 4 DIE CASTING MACHINE

WICKES . . manufacturers of heavy duty engine lathes and other specialized machinery for 97 years—now brings you the *fastest-producing, easiest-operating* die casting machine of its size. It's the new Wickes No. 4 Die Casting Machine for lead, tin, and zinc alloys. It's fast!—dies open and close at the rate of 750″ per minute, with a momentary slowdown just before closing. Up to 600 shots per hour —up to 25 lbs. zinc each—are injected at pressures of 1,500 to 6,000 P.S.I. A lightning-fast accumulator injects the molten metal into the die cavity, eliminating auxiliary air compressors and nitrogen flasks. The Wickes No. 4 Die Casting Machine *reduces set-up time to a minimum,* because the distance between bolster plate and platen is easily adjusted from 9 to 23 inches with just one lever. Now dies can be installed in record time—*no time-wasting adjustment of tie bars.* Dual metal pots, alloy steel tie bars, shockless die clamping pressure applied through toggle mechanism.

Our engineers will be glad to show you how the Wickes No. 4 Die Casting Machine will increase your profits by enabling you to produce a wide variety of high quality castings at high speed and lower cost in your plant. *Write today for complete particulars.*

WICKES BROTHERS • DIVISION OF THE
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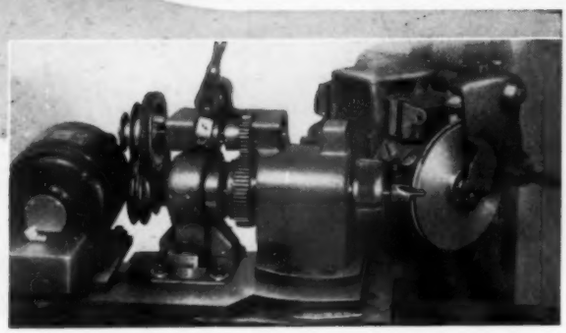
GRIND RELIEF ON TOOLS

like these...

FASTER
EASIER
ACCURATELY



THE CIRCULARITY-GRINDING ATTACHMENT is quickly and accurately set up to grind any of the various types of relief on tools such as those shown . . . radial, form, radial and form relief combined.

No special cams or fixtures are needed for any set-up and no matter what type of relief is being ground, the tool revolves on its own axial center. The amount of relief to be ground is easily adjusted by scales provided on the attachment. All tools ground from a set-up have identical relief produced on them and by recording the scale readings, the same set-up can be made accurately time and time again.

Send for our new illustrated bulletin which gives full particulars on the set up and operation of the Circularity-Grinding Attachment.

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DETROIT REAMER & TOOL CO.

Mfrs. of Special High Speed Cutting Tools

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quire into the causes of faulty work and advise as to the action required for its elimination or reduction. His services in this direction were found to be most useful. In another instance, an old foreman was given customers' complaints to handle. Again, his experience proved valuable.

It is good to let it be seen that for old servants there is kindness, respect, and honor.

J. E. Powell
Lincoln, England

•

GUARDS OR PRODUCTION?

Safety engineers are always unpopular with production men and often with maintenance squads. Their chief concern is a declining accident rate, while the production man aims at rising output.

In order to attain his objective, the production man strives to get the business of production down to a fine art in the matter of planning and speed. The safety engineer pursues a parallel course in relation to safety, frequently with scant concern for planning and speed. Long experience with both aspects of industrial life convinces me that splitting the difference may be the solution.

It is sometimes amusing to note how many things a safety engineer, previously employed as foreman on production or maintenance work, can see that want guarding. Clearly a case of poacher turned gamekeeper.

On piecework, the less competent are generally less sure of themselves, inclined to be hot under the collar, racing the clock, and in their agitated haste, more accident-prone than their cooler, more confident, more capable workmates.

A new operator was employed on a modern, high-speed machine. He spoiled two jobs and had three minor accidents in a short time. An observant foreman reported, "A very nice young fellow, keen as mustard, but excitable and afraid of the high-speed machine." The man was transferred to a heavier and slower-moving machine, and in a few days seemed a different man: no more spoiled work, no accidents, more confidence and much happier.

This human factor is worthy of more attention by safety engineers and production manager. Better selection and more appropriate allocation might be worth some study.

It is notoriously true that some guards slow down production mostly because the safety engineer took the easy way out. It is seldom impossible to design a guard which won't

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To attain maximum efficiency in your broaching operations, Illinois Tool Works broach engineers work closely with your production executives to develop broaches exactly suited to the detailed requirements of your application. This design service . . . combined with the work of master tool makers and specially built production and inspection equipment . . . is your assurance of superior performance with Broaches by Illinois Tool Works.

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ALLEN SQUARE HEAD SET SCREWS

Where socket heads are not required for safety and convenience, Allen offers a high quality, super-strength square head screw in a broad range of standard sizes.

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Allen-TYPE screws aren't necessarily Allen-MADE. Be sure to get genuine ALLENS. SOLD ONLY THROUGH LEADING DISTRIBUTORS

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hinder the operator, but in too many cases it is easier and, on first cost, cheaper, to design one that will. The ideal safety engineer aims at making production safe and not at making safe production.

In British works today, safety engineers direct a lot of time and energy to coddling the workers as if they were children, instead of grown men and women, with intelligence enough to be made responsible for their own safety after the owner has taken all reasonable steps to insure that danger points have been attended to.

It is impossible to go through life without taking risks; life itself is something of a gamble, and "safety first", when it becomes an obsession, is definitely demoralizing. There may be more in Harold Lloyd's "safety last" than meets the eye.

C. D. Mackinnon
Lanarkshire, Scotland

•

Ed certainly does seem to belong to the jungle days of the turn of the century; or is it that he is just conservative and objects to having to take the safety man's instructions in what he considers his own domain?

Many work shops are fortunate, in spite of a lack of precautions, in having few mishaps. This leads thoughtless supervisors to think that this will always be the case. But the law of averages will apply in time, and it is to reduce the chances of accidents that machines must be guarded. Not all accidents will be eliminated, no matter how much care is taken, but their number and seriousness will be very much reduced. Statistics given by leading insurance companies show that where machinery is properly guarded there are fewer casualties.

Many guards do obstruct operation, and it is this aspect which gives the production man an honest grouch. Too many guards are put on as an afterthought, often to prevent the recurrence of an accident. It is because guards have to be fitted to existing structures not suitable to take them that we find many of these security devices a hindrance.

If it can be truly said that a job can be halved by removing the guards, then it is time to reconsider the designs of those guards and have them replaced.

Special-purpose machines are easily guarded, wherever there is a hazard, to give the operator complete freedom form mishap without hindering production in the least, if consideration is given to this question in the early stage of design.

San Bernardino, Calif.,
August 11, 1946.

The Cushman Chuck Co.,
Hartford,
Connecticut.

Gentlemen:

It occurred to me that you might be interested in one of your chucks which I have.

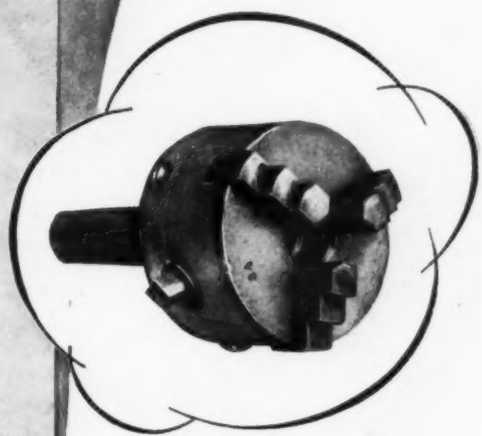
This chuck belonged to my grandfather and then to my father. My grandfather was past eighty when he died 37 years ago. My father had a gun store and repair shop about 70 years ago and used it there. It is still in perfect condition. It has the name CUSHMAN and No. 24. No doubt your records will show when it was made.

Do you know any of your chucks as old as this that are still in use?

I am a machinist employed by the Santa Fe R.R. and have this chuck on a little lathe in my workshop at home.

Yours truly,

F. W. Davis



UNRETOUCHED PHOTOGRAPH.
CHUCK MADE ABOUT 1876.

A Tribute to American Craftsmen

Naturally we were proud to hear of this Cushman Chuck which has faithfully served no less than three generations of machinists . . . and is still going strong. But what we like best about this letter is something written between the lines . . . a story of family pride in fine craftsmanship and fine tools which is a fortunate American heritage.

THE CUSHMAN CHUCK CO.
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Comprehensive Series of
CUSHMAN POWER CHUCKS
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AIR CYLINDERS
are now available.
Write for Catalog PO63 and Bulletins

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2 NEW WILLSON MONO Goggles

Newly styled plastic eye protection with choice of curved or flat lenses offer new features designed to add to their already predominant popularity. The WILLSON MONOGOGGLE, just over an ounce in weight, is the answer to getting safety equipment worn on many hazardous jobs.

- The new flat lens design retains all the safety features of the curved lens.
- Both provide ample room for wearing of prescription glasses in comfort. The flat style, however, provides additional clearance for molded spectacle frames.
- New drop-eye shape gives wider vision.
- Greater ventilation area provides better air circulation and more wearer comfort.
- Both new designs available in clear acetate frames or the new flexible, mottled-brown, polythene frame.

WILLSON*

For complete information on these products and their application, as well as other eye and respiratory protective devices, get in touch with your Willson distributor or write us direct.

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With shapers and other general-duty machines, however, it is a different matter. Due to the relative positions of work, and tool changing with every job, and the infinite number of combinations possible, it is not practicable to devise a guard suitable for this part of the job. But this does not prevent all other mechanism from being made safe and yet easily accessible for the limited amount of adjustments required.

Harry Clarke
Darlington, England

•

SWAPPING SHOPS

Many men spend their whole working life in one shop, which is restricting, both to mental development and attitude and methods of working.

It is perfectly true that one can spend a lifetime at one's job and still not know all the answers, but if the other fellow has happened upon a solution or two, taking a peek at what he has discovered, and letting him see the progressive steps you've made, reduces the task for both. Because "knowledge is power," this adds to the store of tools with which to make more discoveries.

However, many shops are afraid to let others see evidence of their progress for fear of their own necks, not taking into account that it is a two-way proposition. Every trip through another fellow's plant is educational.

One finds often, however, that men in supervisory positions are totally unfamiliar with the trade names of equipment or the companies making them, simply because they do not have such a brand or type in their own shop. There are actually machine-shop men grinding on lathes who have never heard of nor seen a Heald or Bryant, and think Norton makes only grinding wheels. As for "Hydrotel" or "Bowgage," they sound like double-talk. This might come as something of a blow to these firms' advertising departments and also to those responsible for the excellent copy material in such trade magazines as AMERICAN MACHINIST, but they doubtless realize that there are some people who wouldn't be aware of the printed word if it were pasted in their hats. One "See" is better than 1000 words.

Men that make trips to other plants are never quite the same again; narrowness of vision is modified, and abrupt "no" now becomes, "Let's try it."

Personally, I'm all for Swapping Shops. If not already here, it shouldn't be long arriving. National Tool Shows, Society Conventions, in-

ONLY PHILLIPS RECESSED HEAD SCREWS

HAVE THESE JOB-PROVED MECHANICAL ADVANTAGES

RECESS EDGE IS ROUNDED AT TOP

Prevents pushing up burrs because contact with driver begins just below top surface of screw head. Easy for driver to "ride in" to a firm seat, without excess strain on driver.

WIDER OPENING AT RECESS CENTER

Absence of sharp corners provides wider center opening. This recess shape aids self-centering of driver. It also permits driving tool contour that insures maximum strength.

RECESS WALLS HAVE MINIMUM TAPER

Steep walls resist tendency of driver to ride or "cam" out of recess. Consequently, less end thrust is needed at any torque. Driver seats fast—stays seated.

THAT HELP ANY WORKER SPEED DRIVING—AVOID WASTE

SPEED ARTIST

Makes every second count. Won't take time to fuss with finicky recess designs. Wants Phillips' fast, easy "ride-in" to a firm seat without burring—to gain time for more production.

MUSCLE MAN

A little "heavy-handed". Hates driver "skids" because he knows their cost in delays and damage. Wants Phillips' automatic self-centering—knows it prevents "skids". Likes rugged Phillips' driver tips.

GREEN HAND

Wants to learn fast to work fast. Needs assurance of easier fit of driver in Phillips Recess. Can expend effort in *turning* screw, not in holding driver in recess. Avoids "skids" that gouge work or hands.

ANY TYPE OF WORKER on *any* assembly will find the Phillips Recess mechanically right for fast, trouble-free screw-driving, and for driving tool economy.
Top skilled workers might gain some advantage with any type of cross recess. But many are not top skilled.

The Phillips Recess is designed so no concessions in driving skill are needed. It is engineered for *practical production driving*, and it's job-proved design is one of the five essentials of a *standard* cross recessed head screw. Make sure you get all five . . . specify Phillips.

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Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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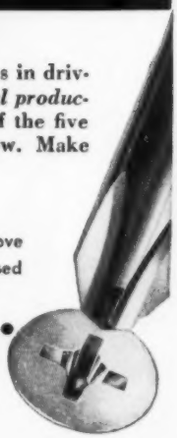
GET THIS NEW BOOKLET of facts that prove the top value, top economy of Phillips Recessed Head Screws. It's free . . . use the coupon.



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plant clinics by trained specialists, and colored sound films, available from equipment, tool, and material suppliers, are making a whole new class of exchange students, and gradually eliminating the mental stricture of the fellow who didn't need to tell you,"I never left home."

A. M. Elliott
LeRoy, N. Y.

•

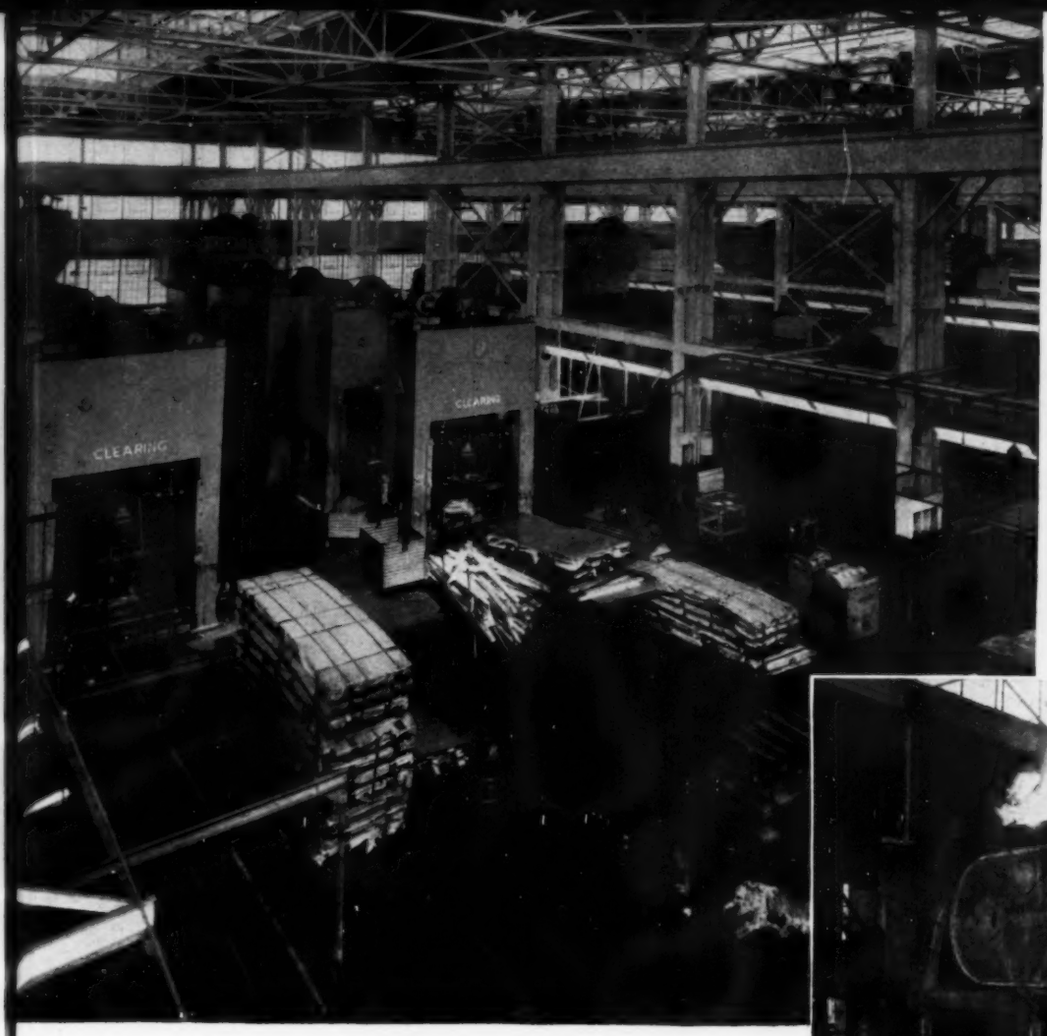
WHO HIRES THE BOSS?

Worker's ideas and suggestions on improving operations and management procedure are being given audience, consideration, and support by progressive management. The actual tangible expression of the worker's ideas to management for its serious consideration may well prove to be an important factor in improving employer-employee relationships.

Good supervision generally engenders good work. If the laborer is worthy of his hire, it is axiomatic that the worker's interest in the job and the organization is worthy of management's consideration. A review by the company of the advisability of discharging the popular supervisor is necessary in order to prevent an unfortunate effect on employee morale.

Before the company makes the final decision on changing supervisors, representatives of the workers should be permitted to state their viewpoint. The confidence of "Topside" in the ability of the worker to help solve management problems will pay dividends in the increased interest of the worker in his job.

It has been found that plant morale may best be measured by the degree of cooperation that is extended to maangement by workers during ordinary routine operations. This cooperation is not always achieved through payment of high wages, extensive service work, or even through participation in management by employees. All these factors will have their influence, yet in many plants, where numerous steps have been taken toward bettering these phases of management, success has not been achieved in building morale. This may have been caused by lack of confidence in managemen on the part of employees. Today, management refuses to accept as necessary worker disinterestedness. Every effort is being made in far-seeing organizations to create and arouse worker interest. Plants attempting to create and maintain morale among workers try not only to maintain a stable working force, but to arouse in the minds of individual workers the conviction that their jobs are important, and that they are important members



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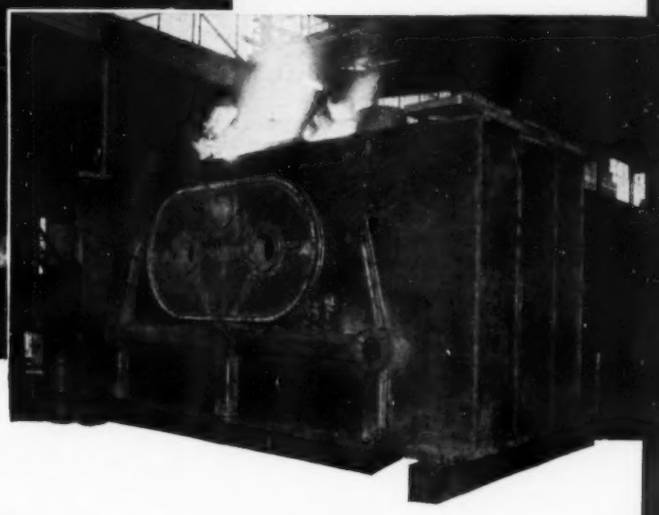
CLEARING
MECHANICAL & HYDRAULIC

INSET: Clearing presses are built of rolled steel plate welded into one unit insuring minimum deflection at maximum rigidity. This type of construction permits the flexibility of design for which Clearing is well known.



WHY STOP SHORT OF MAXIMUM ECONOMY?

Production men agree that press methods are faster and far less costly than other means of giving shape to metal—but why stop there? Careful choice and application of the press itself can usually produce still further cost reductions.

A most important factor in press operation costs is the life of the dies. Frame rigidity and proper guiding of the slide make dies last longer and require fewer regrinds. That's why Clearing has always emphasized these features in its design. Clearing *pioneered* the welded, all-steel frame because such frames are inherently more rigid.

Save money by pressing rather than casting—yes. But secure *maximum* saving by doing the press job on a Clearing. Ask us to show you how and why. It costs you nothing to ask for facts.

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That's one reason the Wysong and Miles 10 Gauge squaring shears are ideal auxiliary machines. Relatively inexpensive, in both initial investment and operating costs, they are precision machines with an accent on accuracy and speed.

An important feature is the compensating holddown, with a spring actuated plunger in each foot. Even small strips are clamped firmly without adjustment.

The ball-bearing back gauge is set by a handwheel dial reading, adjustable to .0078 (1/128th) of an inch. Taper shearing is easily accomplished.

Another feature is the jaw-type clutch, so simple in design and operation that it requires only periodic lubrication. For safety and convenience, a non-repeat unit can be set to stop shearing action after each stroke.

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Now the PRESS-RITE Press line provides

1. **New built-in single stroke non-repeat mechanism.**
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3. **Anti-friction roller bearings in flywheel.**

With the design of the new safety engineered single stroke mechanism and the new automatic cam actuated brake, PRESS-RITE Presses now have the greatest safety features ever built into a line of punch presses.

Available in 5 ton—10 ton—12 ton—18 ton—and 30 ton models.

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of the industrial community. It is the development of such points of views in the worker's mind, quite as much as the material rewards involved, that make for the success of the organization.

Management must seek ways and means of looking at the plant through the eyes of the worker, in order that it may take steps to eliminate those factors which are the cause of the failure of the workers to cooperate. It should consider major policies with the worker's point of view in mind. Management should be in constant touch with the pulse of the workers, and guide their own decisions, as well as those of their employees, along lines which will make for whole-hearted cooperation of the workers.

Management should prove to the worker that he is not a cog in the machinery of production, but rather a vital section of the machine, regardless of how small his share in the productive process may seem to be. The most effective way in which management may prove its interest is an intangible one: its general attitude. To secure cooperation of workers on the basis of such an attitude is a gradual achievement and one that is based on effective handling of particular situations. A good illustration is the one under discussion. The company's decision to dismiss the supervisor, without regard for the workers' petition, will create a feeling of resentment and make the employees feel that they have no voice in the business. If, through representatives, however, the problem is handled by joint action of the employer and employee, full and complete cooperation of all will usually be secured. Uncorrected grievances soon come to be looked upon as an evidence of the general attitude of the company.

The plant which maintains the confidence of its employees will operate smoothly. Common interest indicates that employees should have a voice in company treatment of supervisory personnel.

To treat workers fairly by hearing their petitions will do more for morale than a cavalier treatment by management of their requests.

Harry Kaufman
Philadelphia, Pa.

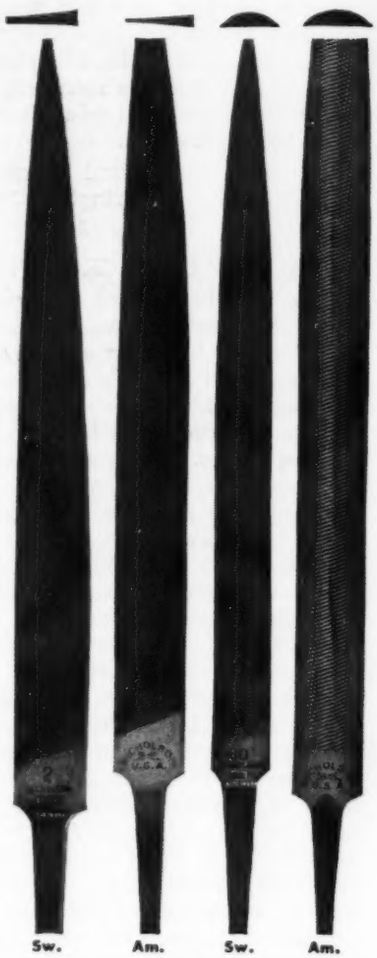
•

Sampson must be very popular with his men for them to circulate a petition in behalf of his reinstatement as their boss. Usually it is the other way round. However, it raises a question in my mind. Why are the men so anxious to keep him in

"PRECISION FILES FOR PRECISION WORK"

is a rule that pays off well in better results, fewer rejects, lower costs. This is one of a series of advertisements on special-purpose files. Save it for shop use and purchasing reference.

Subject: SWISS PATTERN FILES — **Prepared by Nicholson File Co.**



Typical comparisons of Swiss and American Pattern Files—Knife and Half Round shapes

Die making with Swiss Pattern Files

DIFFERENCE BETWEEN SWISS PATTERN AND AMERICAN PATTERN FILES

Nicholson X.F. Swiss Pattern Files are manufactured in accordance with the original Swiss designs or patterns and differ in a number of respects from American Pattern Files. Swiss Pattern Files were first made for jewelers, watchmakers and fine toolmakers. Today they are used wherever superfine precision filing is required.

Although the cross-sections of some Swiss Pattern and American Pattern Files are similar, many of the shapes are different. Other important differences are: (a) Swiss Pattern Files are made to more exacting measurements. (b) Their points are smaller and the tapered shapes have a longer taper. (c) They come in *seven* degrees of coarseness, against the three usually supplied in American Pattern.

USES. Swiss Pattern Files are used extensively in automotive and aircraft factories; in die-casting plants; by makers of delicate instruments and optical goods; by workers on precious metals; for finishing and dressing dies of all kinds; for wood and ivory carving; and for model making.

These files are primarily finishing files and in general are used for removing burs left from previous machinery operations, rounding out slots, smoothing up small parts, and final finishing on all sorts of delicate and intricate pieces.

SPECIAL GROUPS. The Nicholson X.F. Swiss Pattern line includes such special-purpose groups of files as: Die Sinkers Files; Round and Square Handle Needle Files; Filing Machine Files in various shapes, sizes and types; Silversmiths and Die Sinkers Rifflers. Individual types include: Crochet, Barrette, Slitting, Crossing, Pippin, Joint, Screw Head, Warding, Equaling, Pillar (in three standard widths).

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...Stand-by Pump Units in case your built-in pumps fail

... automatic Die or Stock Lubricators on punch presses
(Ideal for coil stock)

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Volume to 43 GPM—Pressures to 50 PSI
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1953 Ridge Ave. Evanston, Illinois

charge? Is it because they sincerely respect and admire him as a good boss, or is it because he is an "easy-mark"?

Frequently, when a man has been on the job over a period of years, he slackens his efforts, gets loose on discipline and in general just gets too "chummy" with the boys. If such were the case (and I'm inclined to think it is with Sampson), no wonder his men are ardent in their efforts to sidetrack his dismissal. They are more concerned about losing a good thing, not a good boss, and fearful that a new supervisor would mean the loss of their soft ways.

Despite the petition, I should think that Sampson, having failed to give satisfaction to his employers, would not want to stay in his job even if the management should accede to the men's demands that Sampson be kept on. A man who retains his job under such conditions knows that he is on the spot. His management must have had good reasons for wanting to fire him and if they allow him to stay on, you can be sure that they will be more critical of him than ever before. No real man should want the job under those circumstances.

In my judgment, I think that both Sampson and his men are wrong—he for staying after once having been fired, and the men for interfering in matters strictly managerial and therefore none of their business.

Arthur Silvester
Niantic, Conn.

•

Whether through labor unions or not, workers are becoming less and less afraid to express their opinions of affairs of their employers, with which they are directly concerned, especially in regard to fellow employees and supervisors.

To illustrate this, the chief engineer and general manager of our factory often visited the toolroom in the course of his duties to give certain orders, design fixtures or jigs or give other technical aid, or speed work being done. In the latter case, pushing the workers was the source of the friction.

The point was being reached where the men were becoming irritated with his demands that work be done with impossible speed. The "straw that broke the camel's back" occurred when an old hand asked for a month's sick leave and was told to take all the time off—or that he was fired. The rest of the toolroom help banded together and presented a demand to management, under threat of bringing in a labor union, that this supervisor be kept from harassing the help, and that the old hand be reinstated after his sick leave.

The men were granted their requests; the union affiliation was not formed, and peace was reestablished.

Of course, management about to install a foreman need not present him on a ticket and have the men vote on him, but at least it should make certain that the men will be treated fairly and will do their best under his supervision.

Edward Diskavich
Torrington, Conn.

•

BACK UP OR BACK OUT?

Many a man has missed the opportunity to advance because there was no one to take his place. A man who expects to get ahead should break in a man on his old job so that he may be released from it when the advance comes.

Picking a good assistant and training him to carry on is one sign of an efficient foreman. A good right-hand man will absorb all the detail and routine work of the foreman to allow the latter to handle the bigger jobs.

Selecting a man for seniority reasons as a candidate for foreman is foolish unless he has the necessary qualifications. If a man knows that he is to be the next foreman because of length of service, he will be a complete failure. A foreman becomes good when he is able to overcome competition. He would have no competition if he were appointed on a seniority basis alone. Of course, seniority should be considered when an opening occurs, but it should not be the deciding factor.

Frank J. Zarnowski
Rutherford, N. J.

•

Al has the right idea in training men to take over in case he is incapacitated or goes to a better job. The right kind of top management appreciates this. In fact, really progressive top management encourages, if not insists, on it.

One of Frank Gilbreth's methods was to insist on men getting an understudy before they were eligible for promotion. At least he encouraged it as an incentive to those who wanted to get ahead.

The same thing should apply to executives in the upper brackets. When a man begins to feel that he is afraid to have an understudy, he is acknowledging to himself that he has reached his limit. If he feels

NEW "SUPERSOCKET" SETS BY WILLIAMS

"SUPERCHEST" 2001
146 PIECES

51 Sockets • 37 Attachments
58 Wrenches Complete in metal chest with handy tote tray. Openings: 3/16" to 1-5/8" Drives: 1/4, 3/8, 1/2 and 3/4"

35 SCIENTIFICALLY SELECTED SETS FOR EVERY TYPE OF SERVICE

● This new Williams line consists of 35 scientifically matched assortments of various types and sizes of tools, carefully selected and grouped for specific uses. "Supersockets," "Superrenches," pliers, chisels, screw drivers, etc. are included in these many versatile collections.

There are "Supersocket" Sets in 1/4, 3/8, 1/2, 3/4 and 1" drives with socket openings from 3/16" to 2-3/8". The heavy-gauge steel cases are attractively finished in orange and black.

Williams "Superchests" feature removable tote tray, drawers on free action suspension slides and cylinder locks. All cases have convenient compartments that keep sockets at finger tip height. These new sets offer the maximum in convenience, utility and value.

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OPEN END, BOX, ADJUSTABLE & RATCHET WRENCHES; DETACHABLE SOCKETS & SETS; IMPACT SOCKETS; TOOL HOLDERS; LATHE DOGS; "C" CLAMPS; CHAIN PIPE TONGS & VISES; FLANGE JACKS; PLIERS; SCREWDRIVERS; PUNCHES & CHISELS; SOFT FACED "NUPLAFLEX" TIPPED HAMMERS; HOIST HOOKS; EYE BOLTS; ROD ENDS; CRANK & BALANCE HANDLES; THUMB SCREWS & NUTS.

J. H. WILLIAMS & CO., BUFFALO 7, N. Y. *Distributors Everywhere*

SCHERR *aids to precision – production*

Control the Job From Start to Finish with the

WILDER PROJECTOR

New horizontal type for production inspection just out.

Throws a magnified shadow image of the part under inspection against an enlarged drawing of part. Magnifications available, 10x to 200x. Horizontal work table for flat work. Center support and micrometer cross slides for checking forming tools, screw threads, hobs, etc. Eliminates all errors due to "feel." May be speedily operated, with little or no experience. Prevents costly errors and insures initial correctness from the start of a production run. THIS COMPARATOR can be equipped with a new circular type of Surface Illuminator. Base price, $350.

THE SCHERR MAGNI-RAY

An invaluable inspection tool, because it magnifies the work under inspection, floodlights it as well, and gives the immense advantage of "two-eye seeing." No wonder thousands of Magni-Rays are serving in large inspection departments, and other thousands on precision machines or critical toolroom operations. The lens is ground by experts for true magnification. Heavy base permits swinging lens to any position, any height to 14 in. Three types—Model A, 3" lens, 1½x plus, $21.65. Model B, 3x plus, $29. Model C, 5" lens, 1½x plus, $34.

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department and absolutely required for thread inspection. You can see that last ten-thousandth with the Gaertner. You can instantly spot the slightest deviation from correct angle. All eyes see it alike, too—no arguments. Any toolmaker can use it. Wide range of templets for use with the templet ocular head.

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When placed on magnetic chuck, these magnetism-conducting parallels and angle irons will firmly hold small pieces and irregular shaped work. *No need of special clamps or fixtures. THEY RETURN THEIR COST* many times over by quicker setups, more accurate results, less danger of distortion and bowing when grinding thin flat work. Made in many different sizes and shapes. Ask for catalog. *DON'T REGRIND YOUR MAGNETIC CHUCKS—BE WISE—USE MAGNE-BLOX.* Special Offer—Set consisting of 2 parallels 1 x 1¾ x 3¾ plus 2 V-blocks, hard brass and Swedish iron laminations in solid metal case $17.50. Money back if you can duplicate this value.

Write for full details on these tools, and for the Scherr Small Tool Catalog.

GEO. SCHERR CO., Inc.
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that he has, he may be justified in not encouraging understudies, unless he is nearing the age of retirement.

Frank C. Hudson
New York, N. Y.

NEW BOOKS

1947 SUPPLEMENTS TO ASTM STANDARDS—*Five parts. Price $4 per part, or all five parts, $20. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.*

To keep up-to-date the triennially published book of ASTM standards, supplements to each part of the book are issued during intervening years. The 1947 supplements give in their latest approved form some 330 specifications, tests and definitions which were either issued for the first time in 1947, or revised since their appearance in the 1946 book.

Part 1-A on Metals, 350 pages, including 70 standards covering ferrous materials and metals;

Part 1-B on Non-ferrous Metals, covers 334 pages on 70 standards.

Part 2 on Non-metallic Materials (Constructional), in 480 pages gives 85 standards on building products, paint, varnish and lacquer, and other subjects.

Part 3-A on Non-metallic Materials gives 63 standards in 454 pages on petroleum products and lubricants, soaps and detergents, textiles, water for industrial purposes and four methods of testing.

Part 3-B on Non-metallic Materials in 322 pages covers 50 standards on electric insulating materials, plastics, rubber, adhesives, paper and paper products, shipping containers, thermometers and general tests.

•

SOME BASIC TECHNIQUES IN MATERIALS HANDLING — *Proceedings of the Technical Sessions of the Second National Materials Handling Exposition. Published by Clapp & Poliak, Inc., 350 Fifth Ave., New York 1, N. Y. 84 pages. Price $1.00.*

Nineteen papers discuss important phases of materials-handling operations, including packaging, palletizing, system integration, surveys, the handling organization and investment decisions.

This is a useful book for those responsible for handling activities because many papers list specific instructions for analyzing problems.

WANT LONGER TOOL LIFE

. . . LESS DOWN TIME?

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THE TOOL SAVING FLUID

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THE NEW DAY COOLANT THAT SPEAKS FOR ITSELF

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a trial will convince you

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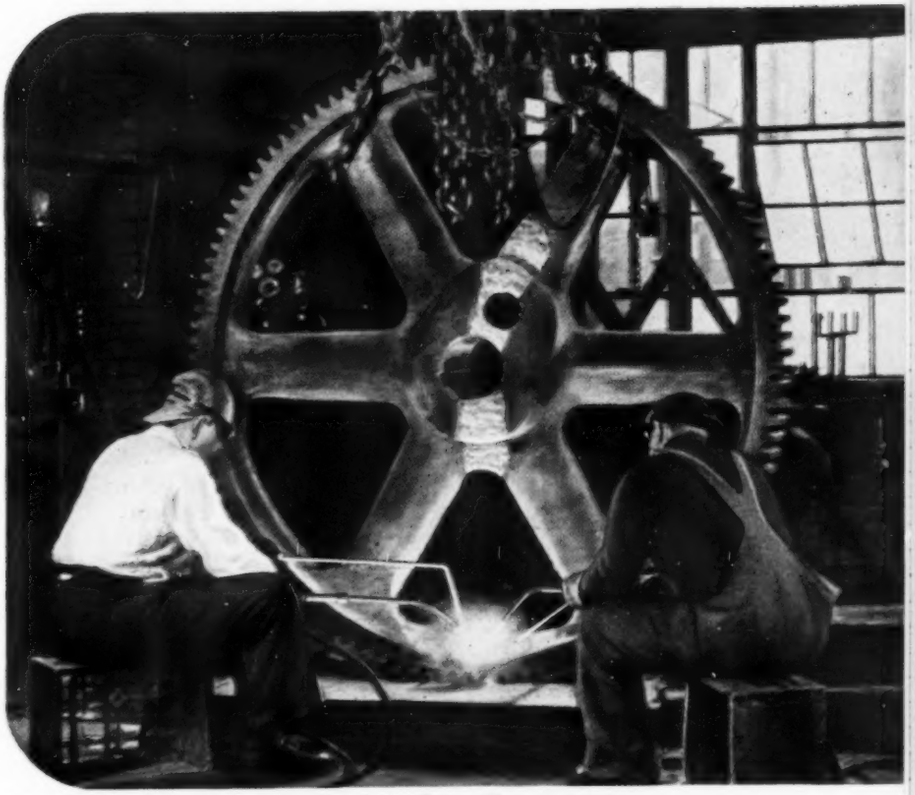
F. E. ANDERSON OIL COMPANY
212 BROWNSTONE AVE.
PORTLAND, CONNECTICUT

Check up on Bronze Welding *now*



When this 7-foot gear broke in half, a whole production unit depending on it stopped dead in its tracks. But in less time than it would take to complete foundry preparations for a new casting, the broken gear was bronze welded and ready for machining the two bores. Alignment of the teeth was excellent, and only a small amount of hand finishing was necessary. The Super Arc Welding Company of Detroit did the repair job, using 235 pounds of Anaconda Tobin Bronze Welding Rod.

Even in the best-managed plants some equipment failures are bound to occur. Next time, instead of thinking in terms of patterns, foundries, machine shops and weeks of delay—think of economical Bronze Welding.

For years this low-cost, low-temperature method of oxy-acetylene repair welding has been used to salvage broken or fractured equipment . . . or to build up worn surfaces. Almost any part made of cast iron, steel, malleable iron or copper alloys can be Bronze Welded quickly and dependably, usually at a small fraction of the cost of replacement parts.

There are dependable Bronze Welding repair shops in most industrial areas, so if your own shop isn't equipped, check with your directory—or the nearest District Office of The American Brass Company. In the meantime, write for Publication B-13, which gives detailed information on the Anaconda Welding Rods listed on the next page.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut

ANACONDA
from mine to consumer

Anaconda
BRONZE WELDING RODS

a baker's dozen of

ANACONDA WELDING RODS

NAME OF ROD	APPROXIMATE COMPOSITION PER CENT	APPROX. MELTING POINT—DEGREES CENT.	APPROX. MELTING POINT—DEGREES FAHR.	SUGGESTED WELDING METHOD AND USE
ANACONDA COPPER 372 Patent No. 2,220,464	98.85 Copper	1075	1967	Oxy-acetylene and inert-gas-shielded arc welding of copper.
DEOXIDIZED COPPER 939	99.9 Copper, deoxidizer present	1083	1981	Oxy-acetylene welding of copper.
SILVER BEARING COPPER 110	99 Copper, 1 Silver	1078	1972	Oxy-acetylene welding of copper.
SILICON COPPER 943	99.75 Copper, .25 Silicon	1083	1981	Oxy-acetylene welding of copper, copper to steel.
TOBIN BRONZE* 481	59 Copper, .50 Tin, remainder Zinc	885	1625	Oxy-acetylene welding of steel, cast iron, copper and its alloys, nickel and its alloys.
ECONOMY* BRONZE	Copper, Zinc, Tin	885	1625	Oxy-acetylene welding of steel and cast iron, etc.
ANACONDA 997 (Low Fuming)	Copper, Zinc, Tin, Iron, Manganese, Silicon	870	1598	Oxy-acetylene welding of steel, cast iron, copper and its alloys, nickel and its alloys. Bearing surfaces.
MANGANESE BRONZE 984	Copper, Zinc, Tin, Iron, Manganese	870	1598	Oxy-acetylene welding of steel, cast iron, copper and its alloys, nickel and its alloys.
SUPER-NICKEL 826	70 Copper, 30 Nickel	1225	2237	Oxy-acetylene welding of Cupro-Nickel and steel.
EVERDUR* 1010	96 Copper, 3 Silicon, 1 Manganese	1019	1866	Oxy-acetylene, carbon arc and inert-gas-shielded arc welding of Everdur, copper and copper alloys. Special applications to steel.
PHOSPHOR BRONZE 903	95.75 Copper, 4.00 Tin, .25 Phosphorus	1050	1922	Carbon arc welding of phosphor bronze and copper. Special applications to steel.
PHOSPHOR BRONZE 310	89.2 Copper, 10.5 Tin, .3 Phosphorus	1000	1832	Carbon arc welding of phosphor bronze, copper and copper alloys. Bearing surfaces on steel.

*Reg. U. S. Pat. Off.

ANACONDA
From mine to consumer

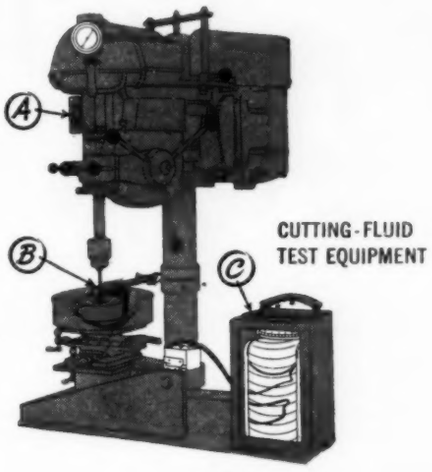
Announcing a **"WHITE-BRONZE" Welding Rod**

Anaconda Nickel Silver 828 is a 10% nickel welding rod for oxy-acetylene "white-bronze" welding of steel and cast iron. Information on welding procedure will be furnished on request.

THE AMERICAN BRASS COMPANY · General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company • In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

CASE 1046--EVALUATING CALOL CUTTING AND SOLUBLE OILS.



CUTTING-FLUID TEST EQUIPMENT

To determine machining values of Calol Cutting Fluids and help make correct recommendations, Standard's scientists developed a Drilling Torque Tester.

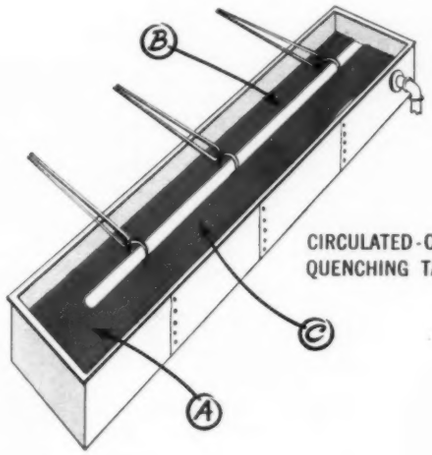
A. Modified drillpress with controlled drilling speeds and feed rate is basic unit.

B. With the Calol Cutting or Soluble Oil to be tested flowing onto a steel test plate, a series of 1-inch-deep holes is drilled into the plate with a precision-sharpened drill. Drill speed is increased 100 rpm for each hole. Test continues until drill fails.

C. Electronic device records the torque curve for each hole. A peak on a curve indicates drill failure. Oils are rated in terms of the speed at which drill failure occurs.

All Calol Cutting and Soluble Oils are given this "breakdown" test. This assures top service from each in the use for which it is recommended -- rapid cooling of tool and work, long tool life and finest possible work finish.

CASE 1049--PRODUCING UNIFORM HARDNESS WHEN HEAT-TREATING AND QUENCHING STEELS.



CIRCULATED-OIL QUENCHING TANK

When batches of Calol Quenching Oils were used for long periods, analysis of the oils at various intervals showed no sign of oxidation or sludging. Repeated tests made after many months of service proved that uniform hardness of quenched steels was still being obtained, and indicated that the abilities of these oils actually improve with use. Come in two types: Calol Alloy Quenching Oil for all alloy steels having a carbon content of less than 0.50%. Calol Quenching Oil for steels having a carbon content of more than 0.50%.

A. Contain no fatty oils to produce disagreeable odors.

B. High stability helps produce uniform work continuously ... reduces danger of brittleness, distortion and cracking.

C. Practically foam-free at efficient quenching temperatures ... may be used with sodium cyanide or salt without ill effects on oils.

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The California Oil Company
30 Rockefeller Plaza, New York 20, N. Y.

The California Company
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RPM CALOL

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make blade selection a cinch not a search!

use the new Victor wall chart

You'll see the name of the blade you want to use — hand, power or band saw — opposite the type of material you want to cut. You'll see this valuable information quickly, easily, when you tack the new Victor wall chart over your tool crib or in your machine shop.

What's more you'll get a lot of inside tips on how to get longer life, the best use, from every blade . . . There are plenty of ways to cut costs, make money, on this new Victor Wall Chart . . . It's printed clearly, attractively, and it's yours absolutely FREE.

Drop in on your Victor supplier — or send him a card today. *The supply is limited.* Also see him the next time you want the finest in cutting performance. He carries a full line of Victor blades—one for every job a hack saw or a band saw can do. Victor blades cut better, too, on metals, plastics, and other nonmetallics . . . cut faster, cleaner, last longer.

3708

VICTOR SAW WORKS, INC.
MIDDLETOWN, N. Y., U. S. A.

Power Hack Saw Blades, Frames and Band Saw Blades

ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

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170 Broadway

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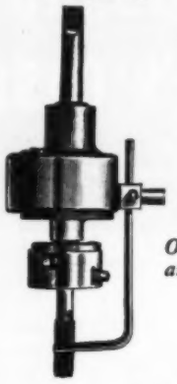
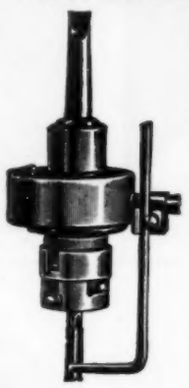
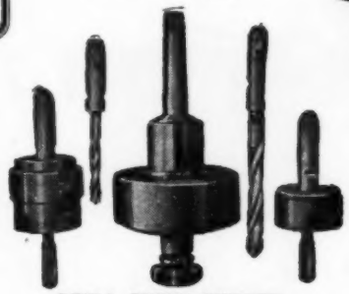
Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛"
" 0	⅛"
" 1	⅛"
" 2	⅜"
" 3	⅝"
" 4	¾"
" 5	⅞"



Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down



Style C Graduated Adjustable Safety Friction

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Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

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They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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Multiple Spindle Drilling and Tapping Machines — Automatic Drilling and Tapping Units — Multiple Spindle Attachable Drill Heads—Hot and Cold Swaging Machines—Hammering Machines — Tools, Jigs & Fixtures — Contract Work — Special Machinery

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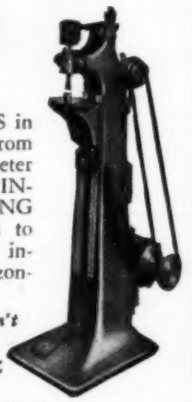
Write for literature and don't forget to send samples.



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Both do the job...
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Both provide circuit protection and disconnecting means, but differ widely in construction and operation. Important features make Square D a logical choice when selecting either type.

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- Ratings from 30 to 2400 amperes, 250 and 575 volts, AC or DC.
- Fusible or Not-fusible.
- Positive-Pressure switch jaws and fuse clips . . . reduce heating.
- Mechanism is heavy duty, quick make, quick break.
- Enclosures are general purpose type, weather-proof and dust-tight, or cast enclosures for special applications.

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- Ratings from 15 to 600 amperes, 250 to 600 volts, AC or DC.
- Thermal-magnetic (coilless) trip . . . eliminates fuses.
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- Magnetic element . . . functions instantly on both moderate and heavy shorts.
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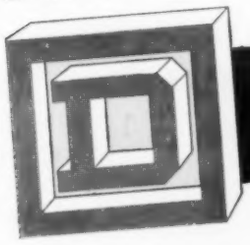
- Mechanism is heavy duty, quick make and quick break.
- Enclosures are general purpose type, or cast enclosures for special applications such as weather-proof and dust-tight or explosion-resisting.

For illustrated **CATALOG DIGEST** *giving complete information on Safety Switches and Circuit Breakers,* **Write Square D Company, 6060 Rivard St., Detroit 11, Michigan.**



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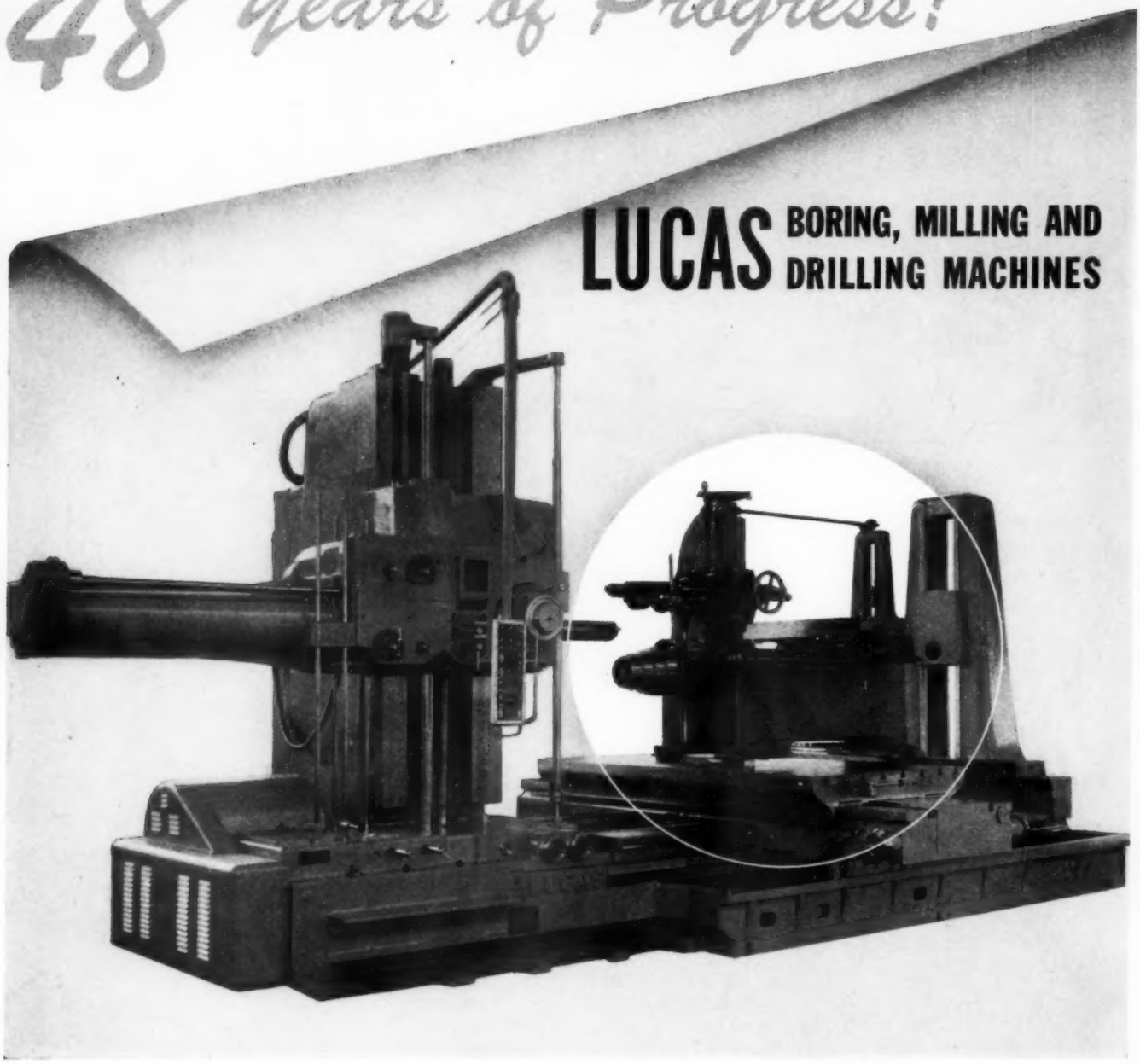

Here's the No. 1 LUCAS produced in 1900—found a short time ago, still serving on the production line! This is the first of the original LUCAS models, many of which are still operating in plants all over the country. We've mounted it on the table of our latest and largest 5-inch Boring, Milling and Drilling machine to show you the vast improvements on this type of machine during the past 48 years.

We believe too, that this is a concrete example of the progress of the machine tool industry—Meeting the demands and progress of the metal working field. Stepping ahead with all industry to greater and more precise production at less cost.

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MANUFACTURING EXCLUSIVELY 3, 4, 5 AND 6 INCH SINGLE SPINDLE HORIZONTAL BORING, DRILLING AND MILLING MACHINES

Illustrates Century 3 horsepower type RS and smaller motors.

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Century Repulsion Start Induction Brush Lifting Single Phase Motors START HEAVY LOADS

Century Type RS motors are widely used to drive all kinds of motorized equipment wherever single phase power is distributed, particularly in suburban or farm districts. They have been satisfying owners for more than 43 years.

Because repulsion start motors have the highest starting torque per ampere of any single phase motor, they are ideal for equipment that must start under full load.

Century single phase motors are built in sizes up to 20 horsepower and other types in a wide range from 1/6 to 400 horsepower to provide top performance to meet every electric power application.

Specify Century for all your electric power requirements.

Century C MOTORS

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The R. H. Sheppard Co., Inc.

Puts Precision Internal Finishing

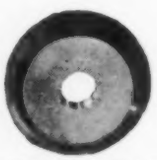
On a Production Basis With

SUNNEN HONING MACHINES

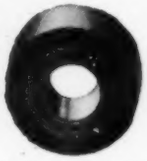
Connecting Rod forging — Hole diameter 1.188", total tolerance, .0005" (five ten-thousandths).

Cast iron piston — Alignment between two holes 1.0625", total tolerance, .0002" (two ten-thousandths). Production 40 pistons per hour.

Bronze fuel injection cylinder — Total tolerance, .00005" (fifty millionths) on diameter of .3125". Production 12 pieces per hour.



Hard steel (60 C scale) governor weight — Total tolerance, .00025" (two and one-half ten-thousandths), diameter .315".



Hard steel (60 C scale) roller — Total tolerance, .0002" (two ten-thousandths), diameter of .2495". Production 40 pieces per hour.

Hard steel (60 C scale) fuel pump cam — Total tolerance, .0002" (two ten-thousandths) on diameter of .250" Production rate 40 pieces per hour.

Sheppard diesel engines are known throughout industry for their dependability, economy and efficiency—achieved by proper design and maintenance of rigid production standards.

On many parts such as those shown here Sunnen Honing holds tolerances as low as .00005" (fifty millionths) or less —at a production rate that is economical in cost.

Here are some of the reasons why Sheppard and many other industrial companies are using Sunnen Honing to produce accurate internal diameters .120" to 2.625":

- Produces straight round holes — accurate to .000025" (25 millionths of an inch)
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- Hones all metals, plastics, ceramics — except lead and babbitt
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- Low in cost — economical to use

Write today for details—or, on request, a Sunnen engineer will call at your plant.

SUNNEN

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SUNNEN PRODUCTS COMPANY • **7930 Manchester Ave., St. Louis 17, Missouri**

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SNOW FULL UNIVERSAL DRILLING MACHINE

The SNOW Full Universal Drilling Machine permits the drill to set its own rate of feed resulting in higher production and greater tool life.

Precision limit switches offer extremely accurate depth control and allow instant synchronization of the many types of air operated indexing and clamping fixtures and jigs which have been designed for use with this machine. Low pressure air control built into this full universal equipment, combined with quality design and construction results in a sensitive and sturdy production machine.

This machine is capable of operating as high as 6,000 strokes per hour and has been production-tested in thousands of installations.

We suggest that you submit sample parts and blue prints for specific recommendations, production estimates and tooling data.

FULL UNIVERSAL TAPPING, DRILLING AND THREADING MACHINES

SNOW MANUFACTURING COMPANY

437 EASTERN AVE., BELLWOOD, ILL. • SUBURB OF CHICAGO

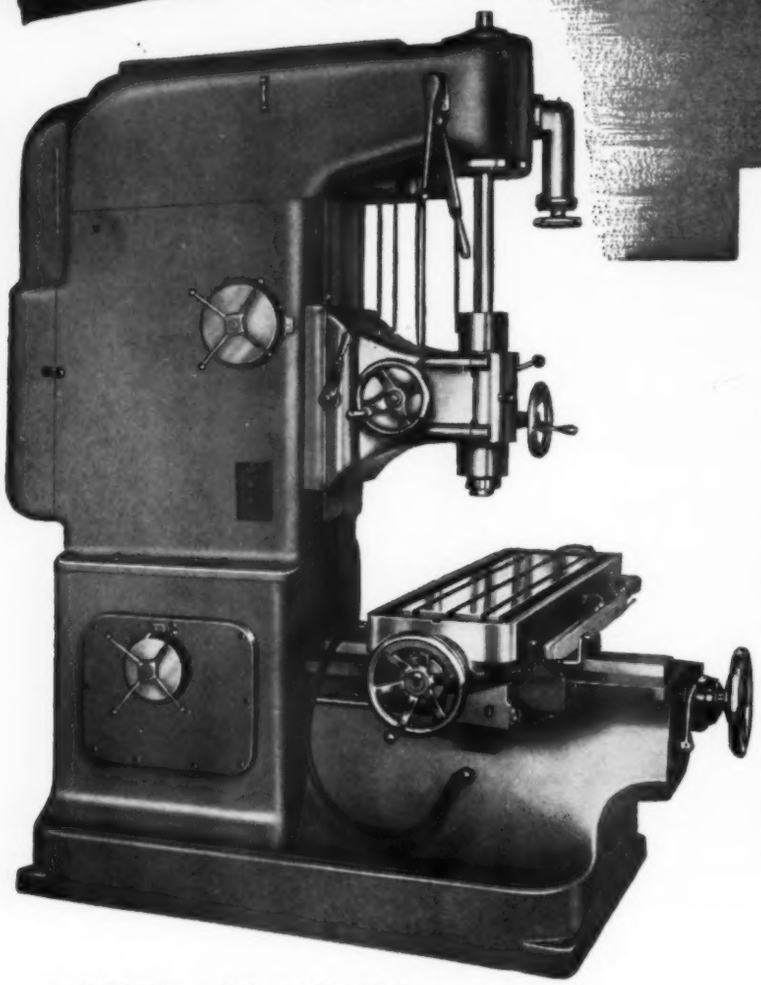
Fast, Accurate Production

More Economically

with the New

No. 50

PRECISION BORING and VERTICAL MILLING MACHINE



The unusual production economy of the new Knight No. 50 is achieved by combining, in a single solid base machine of exceptional range, all the features required for both precision boring and vertical milling. The elimination of time-wasting extra setups and transfers of work save costly labor and make possible much higher output at far lower costs. With a working capacity of greater range than other machines of comparable size, there is also power to spare in the rugged No. 50 for easily and speedily handling the toughest jobs in any shop.

- *16 Spindle speeds from 40 to 2000 r.p.m.*
- *9 Spindle feed from .005" to .010"*
- *100" per minute table traverse, both directions*
- *16 Table feeds, 5/16" to 20" per minute*
- *7½ H. P. drive*

Write Today for Catalog Information

W. B. KNIGHT

MACHINERY COMPANY

KNIGHT VERSATILE MILLERS ACCURATE RIGID

MORE GOODS for MORE PEOPLE at LOWER COST

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DEFINITE TIME ACCELERATION!

REDUCED VOLTAGE STARTING!

EDGEWOUND ACCELERATING RESISTORS!

CLARK Bulletin 6080 A.C. MAGNETIC STARTERS

PRIMARY RESISTOR TYPE FOR SQUIRREL CAGE MOTORS

MOTOR OVERLOAD PROTECTION!

COPPER-TO-COPPER CONTACTS!

SELF-CLEANING CONTACTS!

ARCS QUICKLY EXTINGUISHED BY BLOWOUTS!

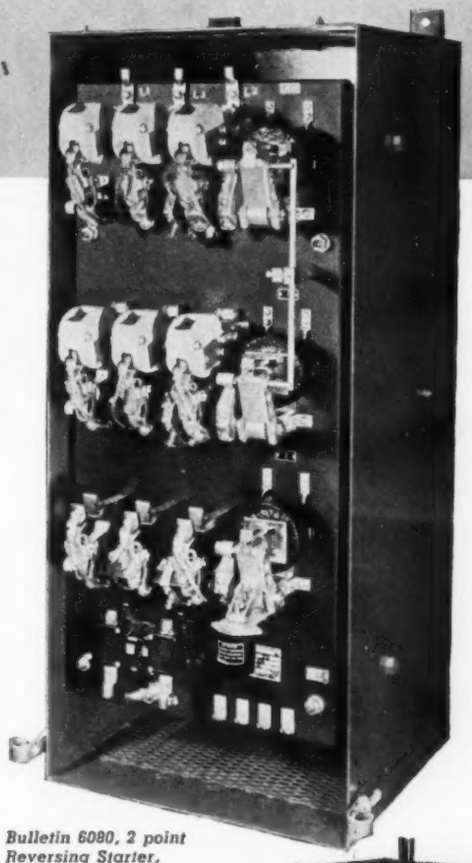
SWING-OUT CABINET FOR EASE OF INSPECTION!

Where mechanical limitations of drives require reduced starting torque or where Power Companies restrict starting voltage,—use CLARK Bulletin 6080 Magnetic Starters for A.C. squirrel cage induction motors.

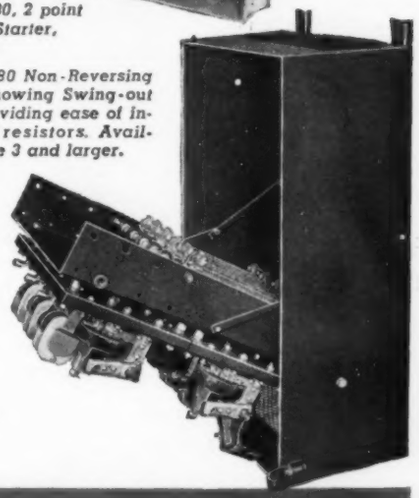
Reversing and Non-Reversing

Starting voltage is reduced by connecting motors to line through a resistor, which is short circuited after a definite adjustable time to allow application of full voltage. Unit consists of line contactor for making and breaking power circuit (two for reversing types), a timed accelerating contactor for short circuiting starting resistors, a class 116 edgewound resistor, and a duplex overload relay. High-inertia type starters for machines with high "fly-wheel" effect, and accelerating time of more than 5 seconds, use class 156 edgewound resistors and long-time-delay accelerating relay.

Bulletin 6080 Primary Resistor Starters are available in reversing and non-reversing types, sizes 2 through 7.



Bulletin 6080, 2 point Reversing Starter, Open view



Bulletin 6080 Non-Reversing Starter, showing Swing-out feature providing ease of inspection of resistors. Available on size 3 and larger.

Especially attractive for machine tool applications —either reversible or non-reversible.

EVERYTHING UNDER CONTROL

THE CLARK CONTROLLER CO.

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Goss & DeLeeuw

THE WORLD'S FINEST MULTIPLE SPINDLE
Chucking Machines

GOSS & DE LEEUW MACHINE CO.
KENSINGTON, CONN.

Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

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FEEDS
AUTOMATIC EQUIPMENT
THE V&O Press Co.
HUDSON, N. Y.

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STUART *service goes with every barrel*

FIGURE THE TIME YOU SAVE *with Nicholson EXPANDING MANDRELS*

Time studies show that, with these widely used precision tools, operations can frequently be completed in less time than was formerly consumed in locating or turning a solid arbor. Sold singly or in sets; for bores ½" to 7". Bulletin 1043.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

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BELLOWS "CONTROLLED-AIR-POWER" DEVICES

for Faster—Safer—Better Production

1 The AIR-HYDRAULIC VISE. Develops a controlled clamping pressure up to 15,000 lbs. on 100 lbs. air line pressure. Maximum jaw opening 5". Jaw width 6". Air controls for hand or foot operations or for mechanical or electrical synchronization to machines.

2 THE AIR COLLET. Stock clearance 1⅜". Controlled gripping force approximately 185 foot pounds torque at 60 lbs. line pressure. "Dead man" safety holds stock tightly even if air is cut off. Can be mounted in any position. Manually and electrically controlled models.

3 ROTARY FEED TABLE. For quick, controlled feeding of work under drill press spindle. 4-6-8-12-24 positively locked stations. 10" diameter removable table with manual or electrically operated air controls.

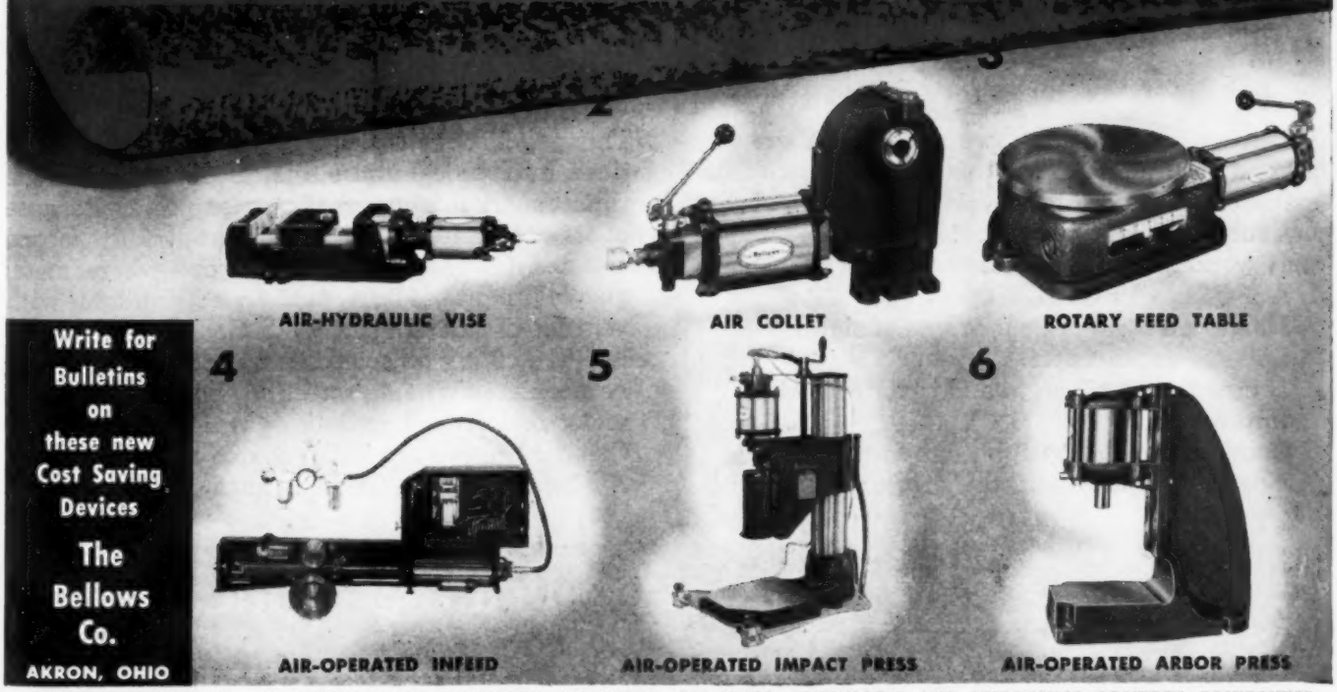
4 AIR-OPERATED INFEED. For accurate, controlled infeeding on centerless grinders. Eliminates scrap, reduces fatigue, holds closer limits, lengthens grinding wheel life.

5 AIR-OPERATED IMPACT PRESS. Impact force controlled from a few pounds up to 5000 lbs. Ram clearance 13-7/16" maximum. Throat clearance 7". Available with manual or electrical air controls for hand or foot operation or with two-hand safety controls.

6 AIR-OPERATED ARBOR PRESS. Develops a controlled thrust of 20 times air line pressure. Ideal for light stamping, crimping, forming and assembly operations. Ram clearance 7" maximum. Throat clearance 5".

No. 928

The Bellows Co.
AKRON, OHIO



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The Bellows Co.
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MANUFACTURERS OF AIR MOTORS, AIR CYLINDERS, AIR FEEDS, AIR VISES, PNEUMATIC AND HYDRAULIC CONTROL EQUIPMENT

A Great Seller

...because it's a Comfortable Eye-Protector!

AO F-9200 Acetate Goggle

When we brought it out, we were sure there was a great future ahead for this goggle of non-flammable cellulose acetate butyrate—but its popularity has surprised even ourselves! Here are its features that workers appreciate:

1. ASSURED PROTECTION.
2. Hinges and temples out of line of sight.
3. Smarter appearance.
4. Lenses that conform to and cover eye orbit.
5. Improved fit.
6. Comfortable, lightweight, face-formed bridge.
7. Nosepads which distribute goggle weight *evenly.*

This goggle does a prime protection job on operations in chemical and electrical plants where the tiniest spark might cause fire or explosion. Because of its acetate construction it is especially recommended for these and similar jobs where metal goggles might not be recommended. Available with ventilated side shields for added safety against lateral-striking objects. Lenses are 6-Curve Super Armorplate. When protection from glare, ultraviolet or infra-red radiations is a "must", specify Calobar lenses. For a handy source of supply, see the AO representative. There is always one near you.

Safety Division of American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

V-type Automotive Engines Machined by DEFIANCE

...PRECISION geared to HIGH PRODUCTION

One of a series of eight multiple spindle machines designed and built by Defiance for machining V-type engines in one of the largest automotive plants.

A series of eight of these Defiance-engineered machines handle the job of machining valve and insert holes in the manufacture of V-type automotive engines.

A difficult job—demanding the utmost accuracy—pacing the world's fastest production lines!

These machines designed with Defiance No. 37 Hydraulic Unit Heads . . . performance-proved in many applications . . . easily adapted to your special problems in drilling, reaming or tapping. For precision and efficiency — to improve quality and reduce costs—bring your boring—milling—drilling problems to Defiance. Write . . . Defiance Machine Works, Inc., 2325 Madison Ave., Toledo, Ohio.

98 YEARS OF PRECISION MANUFACTURE

DEFIANCE

BORING . . . MILLING . . . DRILLING AND TAPPING MACHINES

Why Morton's Salt Tablets to fight "heat fatigue"?

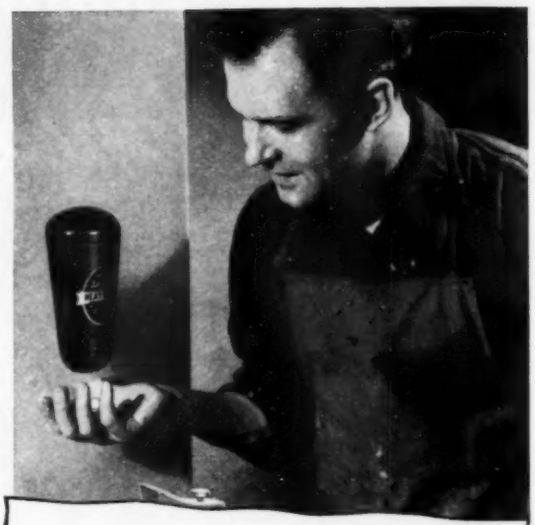
For years, industrial physicians and safety engineers have recommended salt tablets as low-cost insurance against the loss of efficiency and man-hours that "heat fatigue" causes. But it is vitally important that workers **accept** the salt tablets you provide them—are sure they are pure, reliable, safe.

Workers know Morton's Salt

Undoubtedly most of your employees use Morton's Table Salt in their homes. They know it is dependable and pure. So they accept Morton's Salt Tablets. They know they are a wholesome health aid backed by a familiar name.

Cost less than 1¢ a man per week

Morton's Heat Relief Salt Tablets—the best that money can buy—cost so little. Can you afford to be without "heat fatigue" protection in your plant? Order Morton's Salt Tablets and Dispensers from your distributor, or directly from this advertisement. Write for free folder. MORTON SALT COMPANY, 120 So. La Salle St., Chicago 3, Ill.



"Heat Fatigue" costs money!

Sweating robs the body of salt. This causes weariness—inability to work efficiently—and eventually, heat-cramps and prostration. "Heat fatigue" cuts down productivity, steps up absenteeism.

Morton's Salt Tablets act **fast** to replace lost body-salt—help keep production and efficiency at high levels. They're pleasant, easy to take, inexpensive.

Modern Plastic Dispenser. Practical, accurate, large size. 1000 tablet capacity.....$3.25

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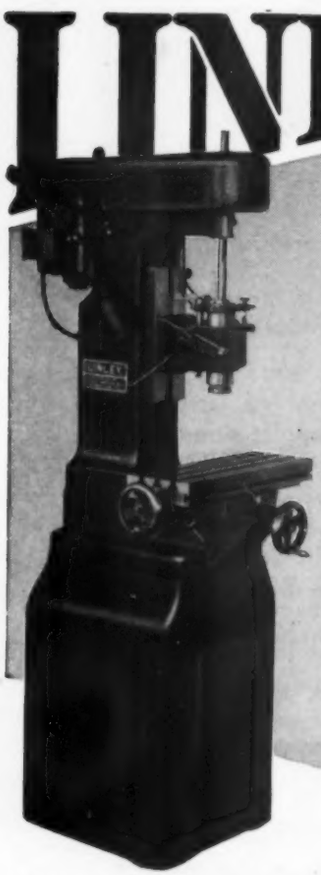
Morton's Salt Tablets Case of 6000, 10-grain, plain salt tablets....$2.10
Case of 6000 8-grain Salt Dextrose Tablets. $2.60

LINLEY



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Handles a wide variety of toolroom jobs with speed, accuracy, efficiency... die work, jig and model making, drilling, reaming, milling. Releases larger machines for work better suited to their capacities. Easy set-up, quick changeover...velvet-smooth feed, eight spindle speeds from 275 to 4250 rpm... simple, direct micrometer setting.

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HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

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For Faster Smoother Cleaner Grinding

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Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

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BAKER *Versatile Model*

3 x 12 HYDRAULIC FEED SADDLE UNIT...

With readily exchangeable Hydraulic Feed Power Unit outside the machine base.

The new Baker one to three H.P. hydraulic feed unit is readily adaptable to special machine application as either a primary or auxiliary unit. Units may be mounted in vertical, horizontal or angular position and are adaptable to single or multiple spindle operations. A completely separate mobile pump-sump unit mounted on casters provides hydraulic power for the Baker 3 x 12 unit through only two self-sealing couplings, designed to allow rapid exchange of power units whenever desirable. For more information write for Baker 3 x 12 circular No. 69946.

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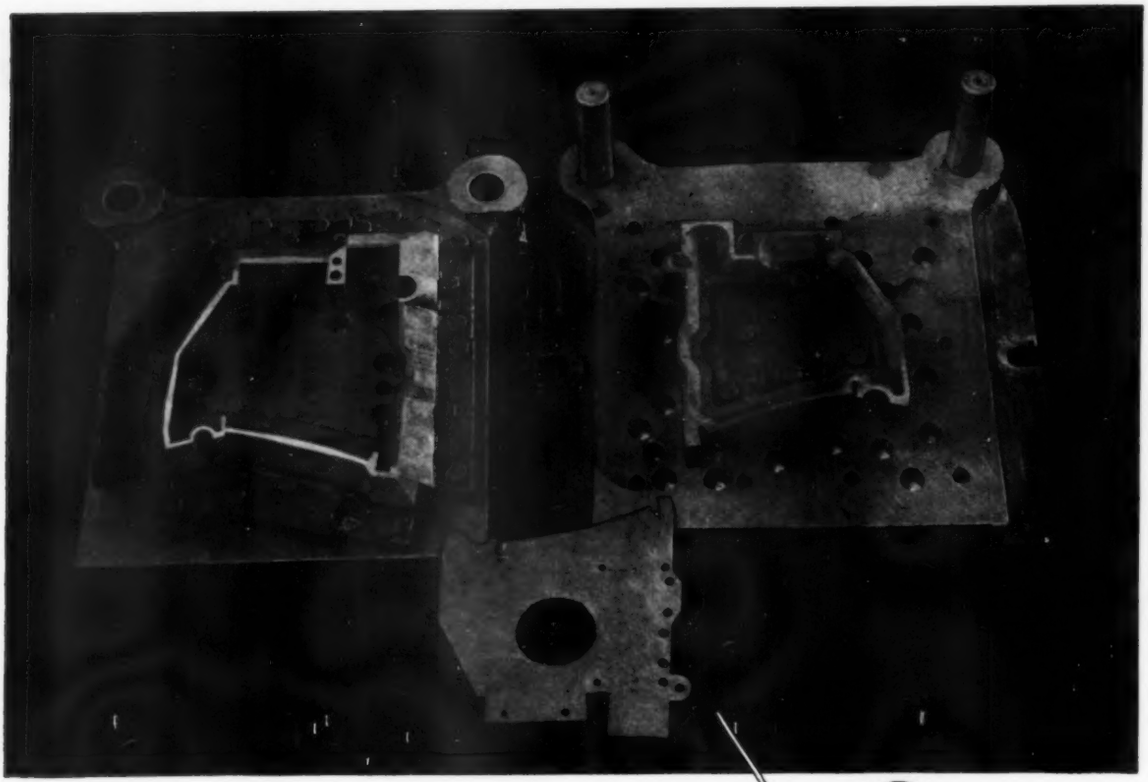
DRILLING, BORING, TAPPING and KEYSEATING MACHINES



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COMPOSITE DIE SECTIONS

Contains complete data on 35 Standard Die Sections, from combinations of which thousands of die shapes can be made —also full information on Special Die Sections, and how to order.

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You can save steel and time in the making of dies for blanking, trimming, beading, or any application involving the cutting of sheet metals to regular or irregular shapes, by assembling them from FCC Composite Steel Die Sections.

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Thousands of die shapes may be made up from combinations of thirty-five standard sections. Specially shaped sections are manufactured to customers' specifications in five to ten days.

● Make *your* dies this money-saving way—full data on request.

ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

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DETROIT 20, MICHIGAN

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THE NEW THOR CHIPPERS ARE

BIG NEWS

IN AIR TOOLING

NEW streamlined design centers weight at the valve block . . . provides handling balance . . . puts weight *behind* the piston to absorb vibration and "kick-back."

No. 33
3" Stroke
Weight . . . 14½ lbs.
Length . . . 15⅜"

NEW plate valve block features large air ports that can deliver even at reduced air pressure full, constant power for faster . . . harder blows.

No. 22
2" Stroke
Weight . . . 13 lbs.
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NEW drop forged steel handle is shaped for comfortable hand grip, with ample clearance for large hands and gloves . . . eliminates cramping and operator fatigue.

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1" Stroke
Weight . . . 12 lbs.
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Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

"Standard" AUTOMATIC

SCREW MACHINE NO. 2

Pat. No. 2,373,155 April 10, 1945

For Higher Production at Lower Cost

"Standard" Automatic with drilling attachment, fabricated base, coolant tank and splash guards.

DESIGNED RIGHT

Quick chucking and rapid camshaft action boost production. All controls are grouped at front for convenience, speedy setup, and ease of operation. Compact design saves floor space and permits bench installation in batteries, 24" on spindle centers. Machine can be furnished with fabricated steel base for floor installation.

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Frame is one-piece, rugged casting machined and bored to close tolerances. All materials and workmanship are of highest quality. Tools are firmly supported for fast heavy cuts and smooth finishes.

PRICED RIGHT

Design economies and simplicity make possible a lower price for the "Standard" Automatic than for other screw machines of comparable capacity (up to 1" bar stock). Because of the low initial cost, you can afford to keep these machines tooled, ready for intermittent production.

Write for descriptive literature and prices.

STANDARD MACHINERY CO.

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EXPORT DEPARTMENT: 1111 South Ferry Bldg., New York 4, N. Y., U.S.A.

Save steel!

Save acid!

Save money!

USE Oakite Pickle Control No. 3 to inhibit hot sulphuric-acid pickling baths! Use Oakite Pickle Control No. 4 to inhibit hydrochloric-acid pickling baths!

Oakite Pickle Controls minimize the attack on steel without retarding the action on scale or rust. They prevent waste of acid after the scale or rust has been dissolved. They have saved some customers as much as 19 cents per ton on steel-pickling operations!

Free Demonstration—The Oakite Technical Service Representative in your vicinity will be glad to demonstrate the efficiency of Oakite Pickle Controls. Ask him for the new Special Report on "Improved Pickling and Neutralizing" or write to Oakite Products, Inc., 24 Thames Street, New York 6, N. Y., for your **FREE** copy.

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All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

Severance CARBIDE MIDGET MILLS

Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C

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May be REGROUND time-after-time by Severance—savings are thus multiplied

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ALMOND DRILL CHUCKS

Maximum Gripping Power with Extreme Accuracy and Long Life

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GROUND FROM THE SOLID
BATH
JOHN BATH CO.

IT TAKES SOMETHING EXTRA TO BE A *Specialist!*

Just as the success of a building project rests upon a properly surveyed foundation . . . so does the established quality of BATH standard and special size taps, depend upon uniform heat treatment of steel . . . properly selected and tested! All BATH taps are toughened by hardening and tempering BEFORE being ground from the solid!

Controlled production through uniform heat treatment is a prime factor in grinding threads with the correct degree of hardness, providing BATH taps with a cutting edge that insures maximum performance and minimum wear!

BATH taps are engineered right from the start —to give EXTRA service! See your BATH representative or write direct about your tap problems.

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Tests prove them 3 to 10 times better

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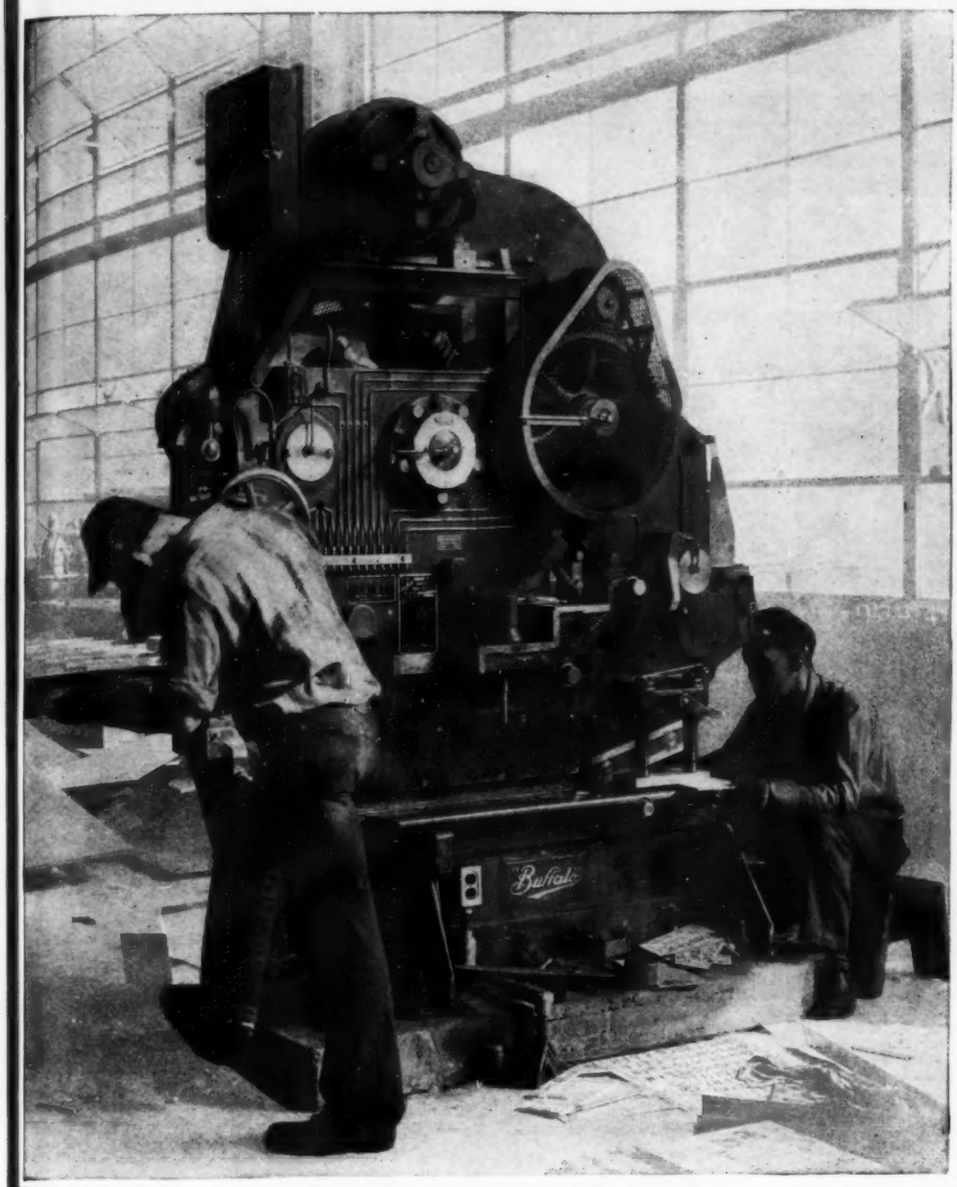
M-40-U ALLOY CENTERS

GORHAM "M-40-U" is a special alloy developed by the Gorham Tool Company expressly for use as a wear and abrasion resistant metal. So superior is this alloy that by *actual test* it has shown results 3 to 10 times better than high speed steel and other alloy materials for centers. Standard M-40-U alloy tipped centers can be furnished from stock. ★ ★ ★ Special M-40-U Alloy centers can be furnished to your specifications, or our engineering department will assist you in the design of special centers to meet your needs. Choose GORHAM "M-40-U" for top performance and long wear.

GORHAM TOOL COMPANY

14400 WOODROW WILSON DETROIT, MICH.

FOR LOWER MANUFACTURING COSTS



"BUFFALO" UNIVERSAL IRONWORKER

MAN-HOUR SAVER *in fabrication!*

• Structural steel shops, shipyards, railway shops, steel mills, other heavy industries, call the "Buffalo" Universal Iron Worker their most useful machine! It cuts, punches, notches, slits or copes angles, tees, flats, rounds, squares, special shapes — with accurate speed that *makes your man-hours count!* Handles three operations at once! Rugged construction for years of 24-hour service! If you want lower fabrication costs, write for the facts on Universal Iron Workers now!

BUFFALO FORGE COMPANY

509 BROADWAY BUFFALO 4, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

MACHINE TOOLS by "Buffalo"

- BACK SPOT FACERS
- BAR CUTTERS
- BENDING ROLLS
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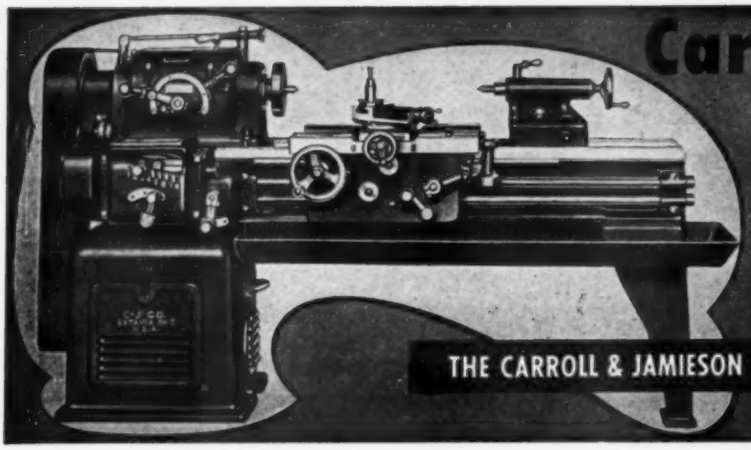
CONTINUOUS SERVICE—FASTER OPERATION—PEAK ACCURACY



Carroll & Jamieson
16" LATHE

12 Speed Geared Head Motor Drive
Timken Mounted Spindle
Modern Design—
Liberal Dimensions

WRITE FOR BULLETIN

THE CARROLL & JAMIESON MACHINE TOOL CO., BATAVIA, OHIO, U. S. A.

HALLOWELL

Steel Collars

Pat'd. and Pat'a. Pend.

"Hallowell" Solid Steel Collars, attractively proportioned throughout, are precision-machined so faces run perfectly true . . . are also highly polished all over . . . yet they cost less than common cast iron collars. 3" bore and smaller are made from Solid Bar Stock and fitted with the famous "Unbrako" Knurled Point Self-Locking Socket Set Screw . . . a set screw that, once tightened holds and stays tight to make sure the collar won't shift on the shaft. "Hallowell" . . . a "buy word" in shaft collars . . . available in a full range of sizes for

IMMEDIATE DELIVERY

Ask for the name and address of your nearest "Unbrako" and "Hallowell" Industrial Distributor.

Over 45 Years in Business

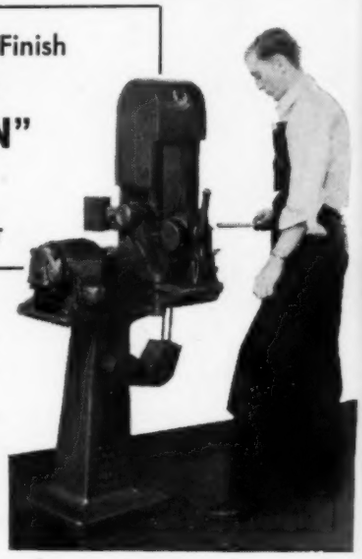
STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 4

BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO

High Speed, Fine Finish
is assured on the

"PRODUCTION"
TYPE S
Centerless Grinder



This modern machine is designed for handling cylindrical polishing as well as straight line finishing. It is ideal for surfacing, polishing or buffing, and can be used for anything that can be ground or polished including steel, brass, aluminum, rubber, fibre, wood, plastics, etc.

The Type S machine can be quickly changed from a horizontal to a vertical position and is fast and versatile.

SPECIFICATIONS

Abrasive Belt: 4" wide, 60" long.
Motor: 1 H.P., 1750 R.P.M.
Belt Speed: 3200' per min.
Dist. Table to floor. (Horizontal position): 36".
Table: 4½"x13½.
Ball Bearing equipped.

Illustrated literature is available promptly on request.

Production
MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

NO BLOWER or POWER NECESSARY

Pipe Burners

Nozzle Burners

Ring Burners

. . . Just Connect to Gas Supply

BUZZER Gas BURNERS

Reg. U.S. Pat. Off.

For Many Industrial Gas Uses

Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

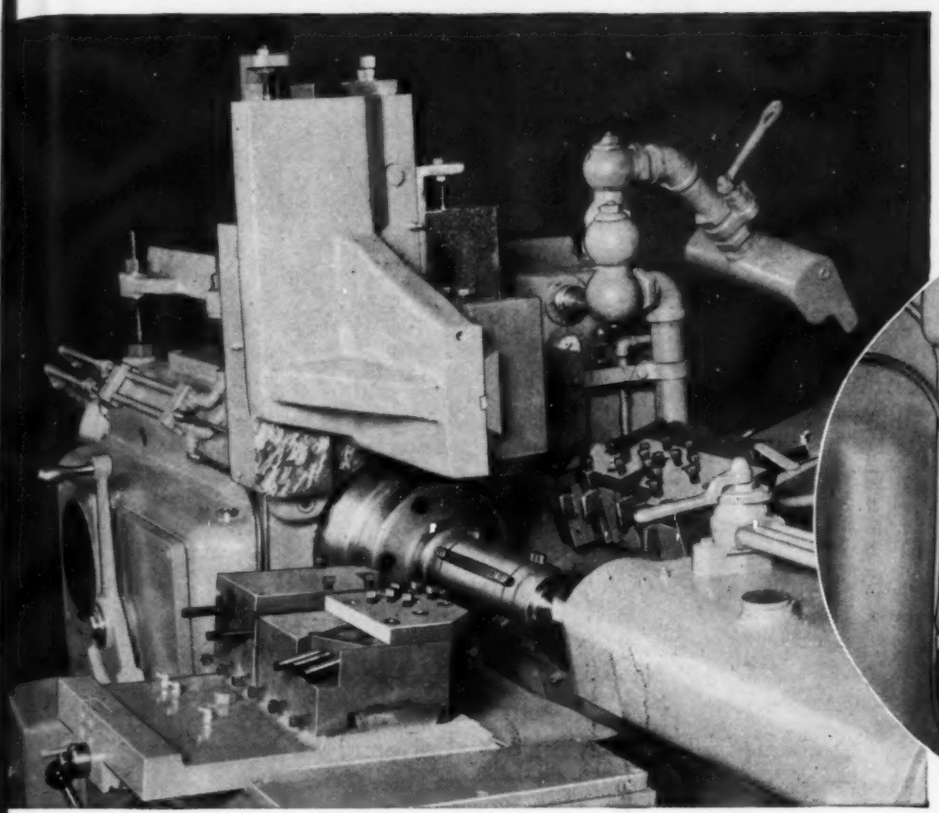
Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

CHARLES A. HONES, INC.

121 South Grand Avenue, Baldwin, L. I., N. Y.

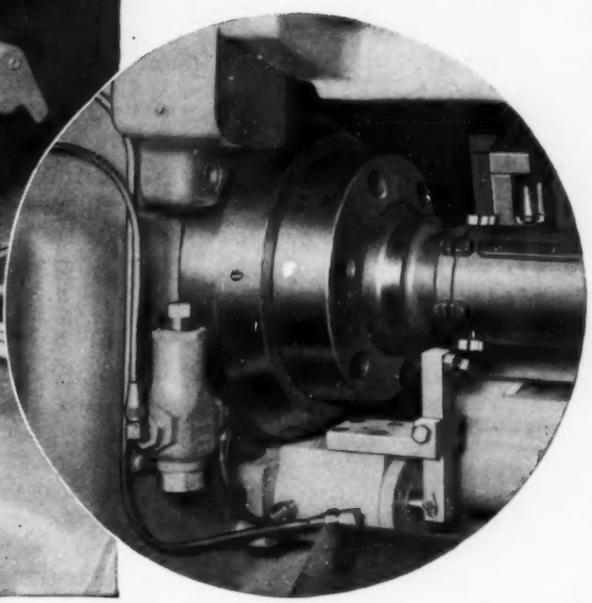
MACHINE OF THE MONTH

EPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK

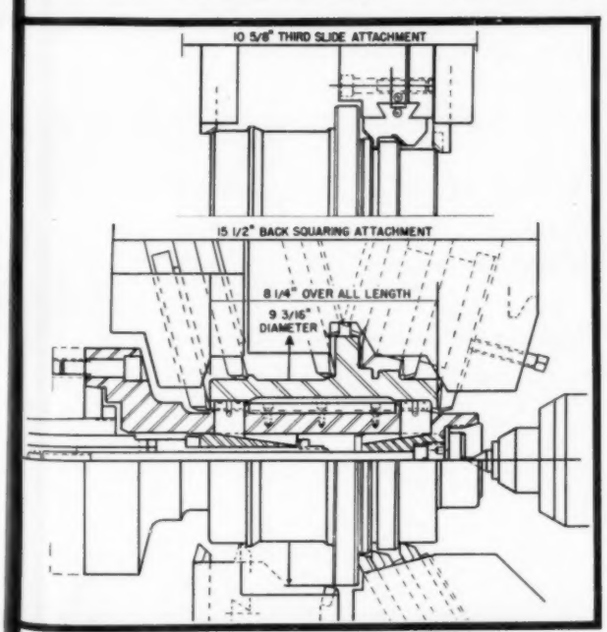


Close-up view of machine showing details of Driving Arbor

Close-up view showing Air-operated Locator



PRODUCTION SPEEDED ON DRIVE GEAR HUBS WITH MODEL "AR" AUTOMATIC Lo-swing LATHE



Problem: **To automatically turn, face and chamfer shoulders, and cut groove on Gear Hub with 9″ Flange diameter, locating and centering from bottom of spline previously machined.**

Solution: **The Model "AR" Automatic Lo-swing Lathe was selected for this job due to its rigid construction and its demonstrated fine performance with cemented carbide tools.**

The expanding, air-operated driver, shown in the line drawing and the main illustration, is fitted with two sets of six driving jaws which accurately center the part true with the bottom of the splines. The jaws are actuated with two independently-expanding bushings and pull bars which equalize the pressure on both sets of jaws. The parts are located longitudinally on the arbor by an automatic, air-operated locator, which moves forward to the exact locating position when the tailstock spindle is withdrawn and relieves when the spindle is advanced.

All diameters are turned with the tooling mounted on the front carriage slide. The squaring, chamfering and grooving operations are divided between the rear and vertical slides in order to simplify the tooling which is used for several different sizes of hubs. The line drawing shows the tooling in detail.

Consult our Engineering Department for Automatic Lo-swing Lathes engineered for your particular turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

RODUCTION COSTS ARE LOWER WITH Lo-swing

GEARGRIND
Heavy-Duty

Constant Velocity
UNIVERSAL JOINTS ...

CONSTANT VELOCITY
over the
Entire Range

•

Now Available in
TWO SIZES

Write for Bulletin MJ-2 containing prints, specifications and full information.

● Geargrind Constant Velocity Universal Joints are free from torsional vibration at all operating angles and speeds. Torque is transmitted through steel balls, positioned in intersecting raceways. True concentricity of the driving members is obtained by a ball socket at the center.

The larger of the two standard sizes now being manufactured has sufficient torque capacity for 600 foot-pound engines. Its momentary clearance angle is 22°, while the fixed running angle is determined by the required speed and torque.

The outer flange is 8 in. in diameter, with eight ⅜-in. bolt holes for mounting. A 3½ by .120-in. drive tube is standard, with overall lengths ranging from 21 in. to several feet.

Correspondence regarding possible applications for trucks, buses, boats or industrial uses will receive prompt attention.

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

Write for Literature

CAPACITY:
Profiles up to 6" in length. Circular work up to 4" in diameter. Flat pieces up to 2" in thickness.

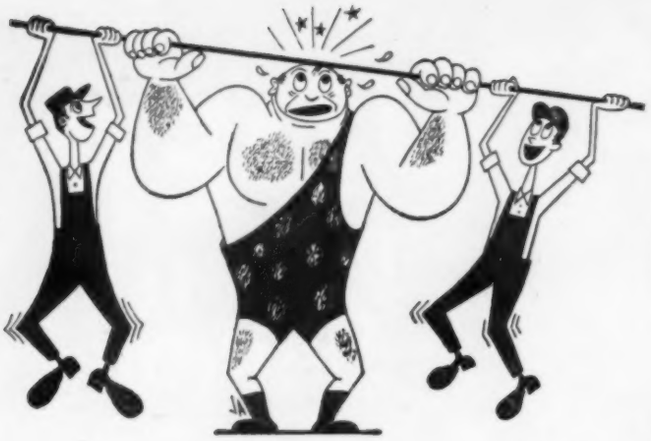
TUNGSTEN CARBIDE can also be ground on this machine.

Get accuracy to 0.0002" on tools, gages, dies, templates and all types of small parts! The Studer Profile Grinder saves time by grinding parts complete in one operation – with one wheel, eliminates preliminary grinding to form on many small profiles. Write for complete information.

COSA CORPORATION

Representing STUDER in United States and Canada

624 Chrysler Building New York 17, New York



U·S·S Carilloy Steels

FEATURE GUARANTEED MINIMUM HARDENABILITY

When you order U·S·S Carilloy Steels, you are sure of two things:

Reliable performance which comes from alloy steel manufactured to a *Guaranteed Minimum Hardenability.*

Prompt filling of your orders through our large and diversified stocks.

And there is another and very important advantage—an additional metallurgical service—to users of U·S·S Carilloy Steels:

You are supplied with a Heat Treatment Guide which contains complete and specific information on the steel you receive with each shipment. That is, you get *specific* data on the composition, potential physical properties and recommended heat treatment temperatures to help you obtain the maximum performance from the steel furnished on your order.

Telephone, wire or write the U·S·S Supply warehouse nearest you.

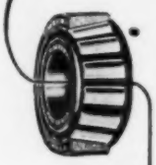
SYMBOL OF SERVICE for Steel Users

UNITED STATES STEEL SUPPLY COMPANY

CHICAGO (90)	1319 Wabansia Ave., P. O. Box MM	BRUnswick 2000
BALTIMORE (3)	Bush & Wicomico Sts., P. O. Box 2036	EDmondson 4900
BOSTON	176 Lincoln St., (Allston 34), P. O. Box 42	STadium 2-9400
CLEVELAND (14)	1394 East 39th St.	HEnderson 5750
LOS ANGELES (54)	2087 East Slauson Avenue P. O. Box 2826—Terminal Annex	LAfayette 0102
MILWAUKEE (1)	4027 W. Scott St., P. O. Box 2045	Mitchell 5-7500
NEWARK (1), N.J.	Foot of Bessemer St., P. O. Box 479	Bigelow 3-5920 REctor 2-6560—BErgen 3-1614
PITTSBURGH (12)	1281 Reedsdale St., N. S.	ALlegheny 4200
ST. LOUIS (3)	311 S. Sarah St., P. O. Box 27	LUcas 0440
SAN FRANCISCO (1)	1940 Harrison St., P. O. Box 368	MArket 1-4988 ENterprise 1-0017
TWIN CITY	2545 University Ave., St. Paul (4), Minn.	NEstor 7311

UNITED STATES STEEL

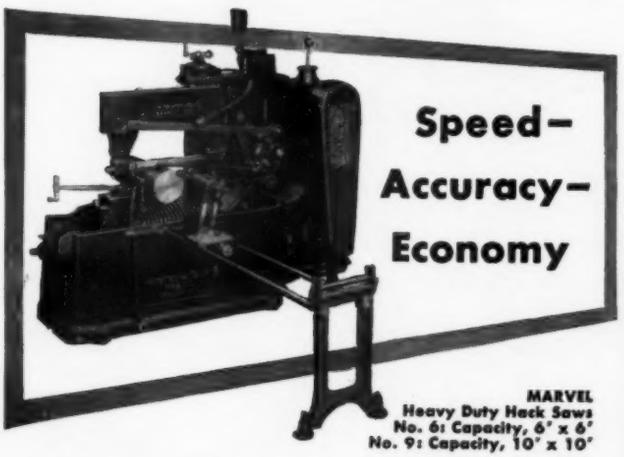
TIMKEN *Zero precision bearings give* SHELDON *LATHES GREATER ACCURACY—*



Because the spindle of the SHELDON TRB-S56 is mounted on Timken Zero Precision Bearings, extreme accuracy, higher machining speeds and lower production costs are insured. These bearings are by far the most accurate tapered roller bearings that can be made in regular commercial production. Runout or eccentricity is restricted to less than .00015 of an inch. Due to the line contact between the rolls and races, the spindle is firmly supported—no chance of deflection. Because of the tapered construction and provision for take-up in assembly, there is no possibility of end-movement.

SHELDON TRB-S56
11¼" Swing
1" Collet Capacity
56" Bed

SHELDON MACHINE CO. Inc.
4234 N. KNOX AVE., CHICAGO 41, ILLINOIS, U.S.A.



MARVEL
Heavy Duty Hack Saws
No. 6: Capacity, 6" x 6"
No. 9: Capacity, 10" x 10"

The MARVEL No. 6 and No. 9 Heavy Duty Saws are ideal for production cut-off work where highest speed, greatest accuracy and true economy are essential.

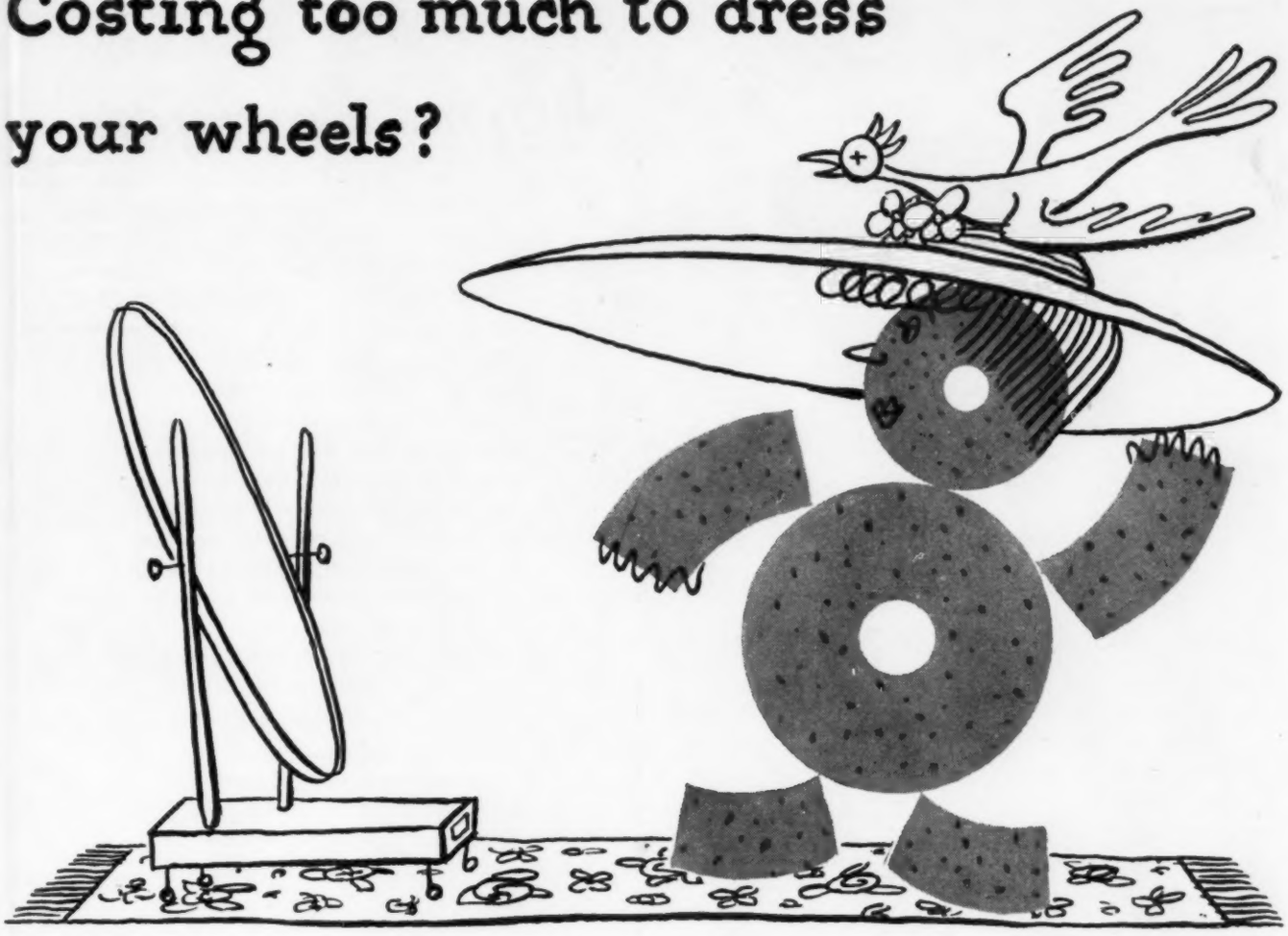
These saws have proven, in hundreds of plants, that they have the stamina to stand heavy duty operation "around-the-clock." They are faster because of the quick return of the saw frame on the non-cutting stroke. They are more accurate because they are fully ball bearing, and they are economical because they get more work from a high speed blade. (Also available with automatic stock push up feed).

There are many more outstanding features described in our catalog. If you want the best in a hack saw—see what MARVEL has to offer.

Metal Cutting
MARVEL SAWS
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave. Chicago 39, U.S.A.

Costing too much to dress your wheels?



. . better use ROBERTSON!

Talk about upkeep! The conventional wheel, which rapidly becomes loaded and constantly has to be dressed and redressed, is doubly expensive. Not only does it wear out faster, but the time spent dressing it represents additional cost, and is time lost from production.

You don't have to baby Robertson Grinding Wheels. They resist loading because their revolutionary "open" structure allows plenty of space for chip clearance. And the results they achieve are outstanding. Take this instance:

A Landis Plain Cylindrical Grinding Machine was turning out only 60 pieces per wheel dressing, using a straight plunge cut with a conventional wheel to remove .015" to .020" stock from 1020 steel bushings, hardened and carbonized to Rockwell C 53-55. When a Robertson sales-engineer was called in, he recommended our RA 464-MV wheel. On the same job, under the same conditions, production was increased to 220 pieces per dressing—nearly four times as many!

The plant superintendent watched this performance with amazement. "That's a *good* wheel," he said. "I don't believe it will ever wear out."

Robertson Grinding Wheels *are* good wheels, precision-built to handle the toughest jobs. Specify Robertson vitrified-bonded or resin-bonded wheels for cool cutting, even on the hardest metals—for accurate, fast production—and for lowered grinding costs. For unusual jobs, blueprint your problem, and let us recommend a wheel for your particular job.

ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Enduring Precision

This spindle bearing is standard equipment on large spindles designed by a world-famous builder of precision grinders. For extreme accuracy, for freedom from vibration, and for enduring precision, only sleeve bearings will do. Where other types of bearing retain their accuracy only for months, Bunting Spindle Bearings endure for years. Where other complex types require a surgical standard of cleanliness and a watchmaker's skill for replacement, the Bunting Sleeve Bearing requires only common-sense and the services of a good mechanic.

The secret of this performance and long life lies in the film type of lubrication. A properly designed and well lubricated sleeve bearing need not acknowledge any superior. No other bearing type possesses its simplicity, its ruggedness, its ability to deliver accurate work for many years. These attributes are possessed by the sleeve bearing.

Bunting engineers are at your service whether your problem is a precision grinder spindle, an aircraft engine, an automobile engine, or something of more or of less exacting requirements. Bunting engineers utilize their extensive experience with bearings of all types in their work of designing Bunting Cast Bronze Sleeve Bearings. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.

Bunting

BRONZE BEARINGS

PRECISION BRONZE BARS

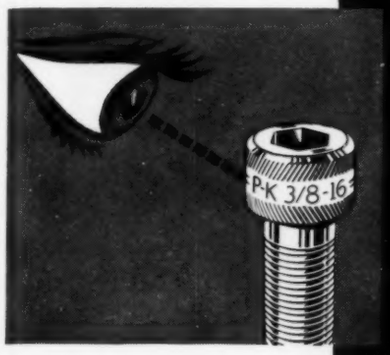
BUSHINGS

76

YOU'RE O.K. WITH

P-K* SIZE-MARK GEAR GRIP†

SIZE
IDENTIFIED



WORK
SIMPLIFIED

SOCKET HEAD CAP SCREWS

*REG. U.S. PAT. OFF. †U.S. PAT. NO. 126,409

THERE'S NO GUESSING with P-K Size-Marked Gear Grip Socket Head Cap Screws. No need to "mike" or gauge . . . no chance for error. The correct size, incised on the head, can be seen at a glance. Installation and repair work on your product or equipment is made simpler and easier — thus adding a valuable sales feature.

NEW WORKERS learn faster — can work faster with Size-Mark. Tests show that even experienced men often guess wrong on size and thread pitch. So why take a chance, when you can tell at a glance — with P-K.

GEAR GRIP prevents slipping and fumbling, speeds assembly, especially when busy hands are oily.

ONLY P-K offers both Size-Mark and Gear Grip in Socket Head Cap Screws. See how they save time and trouble all along the line. Ask for samples. Parker-Kalon Corp., 200 Varick St., New York 14, N.Y.

AVAILABLE FOR PROMPT DELIVERY

PARKER-KALON COLD-FORGED **SOCKET SCREWS**

SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS

OTHER PARKER-KALON PRODUCTS SELF-TAPPING SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS • SHUR-GRIP FILE AND SOLDER IRON HANDLES • METAL PUNCHES • DAMPER REGULATORS AND ACCESSORIES

ROTO-MATICS

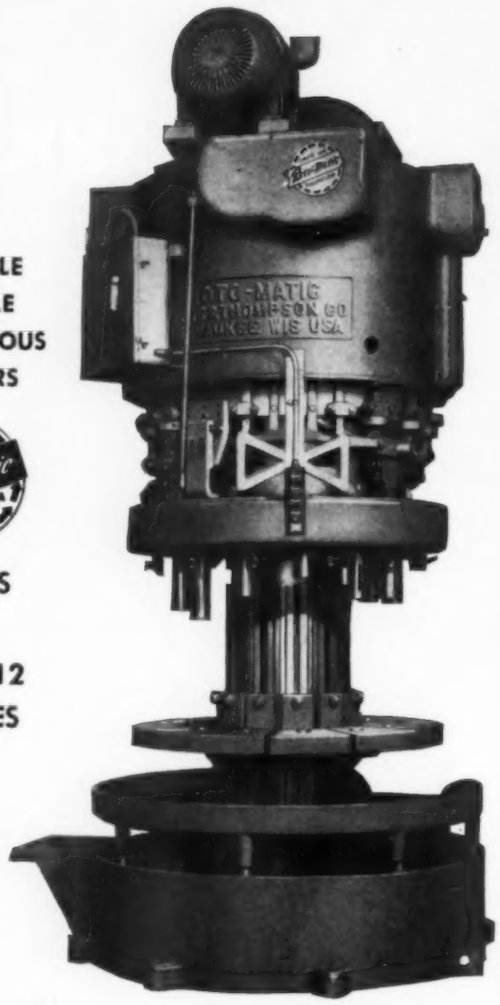
VERTICAL

MULTIPLE SPINDLE CONTINUOUS DRILLERS

DAVIS and THOMPSON Roto-Matic

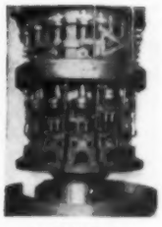
3 SIZES

6-8 OR 12 SPINDLES

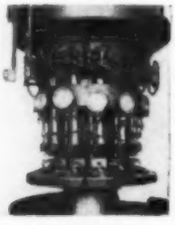


One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.



2 SPINDLE DRILL HEADS



BALANCING OPERATION

AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.

MANUFACTURERS OF *Machine Tools*

MILWAUKEE 14, WISCONSIN

THIS DIAL Controls All FACE GRINDING Table Speeds on the ROGERS NT-20

20" cylinder grinding wheel.

•

10 H. P. Motor.

•

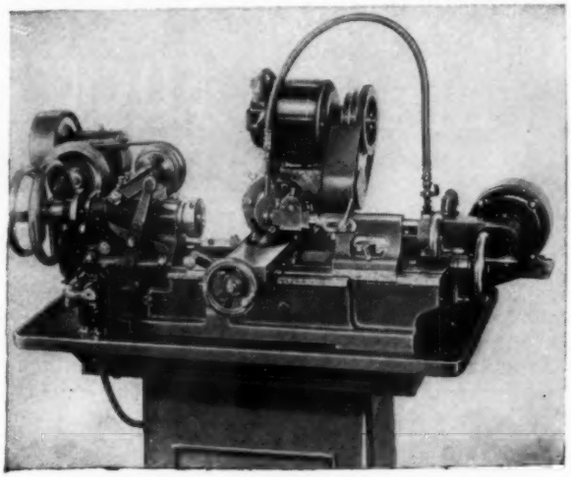
Capacity to 12" high, 16" wide, 72" long.

Table speed changes from 10 to 70 ft. per min. controlled by a single finger tip dial,—*anytime while the machine is running.* Provides correct grinding speed for iron and steel sections . . . and holds it even when the load is increased. No starting shock—reversals are automatic, vibrationless, quiet. The only medium-duty grinder in its price range built for fast, steady face grinding production. Write for bulletin No. 320.

SAMUEL C. ROGERS & CO.

197 Dutton Ave. Buffalo 11, N. Y.

WALTHAM THREAD MILLERS



Cut All Standard Thread Forms Accurately and Conveniently

Standard design includes three motors: one each for speed, feed, and coolant. Capacity: 3" over the carriage, best adapted for 2" in diameter or smaller; thread length (work held on centers) 8¾".

Special equipment extending utility includes attachments for milling internal, multiple, and taper threads and factory equipped machines for relieving and cam operation. Metric lead screw or translating gears can be furnished.

Send for illustrated literature giving complete details.

WALTHAM MACHINE WORKS

Waltham, Mass.

This CATALOG should be at your fingertips

"Fight Friction" contains engineering data which will help you get longer and more economical bearing service

Plant operating men, as well as product designers who are concerned with problems relating to non-ferrous bearings or castings, can use this 16-page booklet to advantage. It contains descriptions, physical properties and specifications of N-B-M Babbitt metals — bronze cored and solid bars and parts. Instructions for successful re-babbitting with N-B-M Babbitt Metals are also included.

The metals described are the result of three-quarters of a century of anti-friction research.

Improved production and alloying techniques are used in making these better N-B-M Bearings and Castings. Competent, experienced engineers are ready and able to help you wage the "war on wear"—help you solve design, alloy, stress loading lubrication, or even more complex problems.

If you're interested in reducing maintenance costs or in increasing the service life of bearings and castings, write for your copy of "Fight Friction" today.

NBM

AMERICAN
Brake Shoe
COMPANY

NATIONAL BEARING DIVISION
ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

Only MO-MAX gives you All THESE ADVANTAGES

Buyer's Guide to Brands of MO-MAX

"LMW" . . Allegheny Ludlum Steel Corp.
"MOHICAN" . . . . . Atlas Steels, Ltd.
"BETHLEHEM HM" . . Bethlehem Steel Co.
"MO-CUT" . Braeburn Alloy Steel Corp.
"STAR MAX" . . . . Carpenter Steel Co.
"MOLITE M-1" . Columbia Tool Steel Co.
"REX T-MO" . Crucible Steel Co. of America
"DI-MOL" . . . Henry Disston & Sons, Inc.
"HI-MO" . . . . Firth-Sterling Steel Co.
"REX T-MO" . . . . . Halcomb Steel Co.
"MOGUL" . . . . . Jessop Steel Co.
"TATMO" . . . Latrobe Electric Steel Co.
"MIDMAX" . . . . . The Midvale Co.
"S. T. M." . . . Simonds Saw & Steel Co.
"MO-TUNG" Universal-Cyclops Steel Corp.
"8-N-2" . . . Vanadium-Alloys Steel Co.
"VUL-MO" . . Vulcan Crucible Steel Co.

1 MO-MAX was the first of the modern molybdenum high speed steels. Since 1933 it has been widely used in all types of cutting tools.

2 MO-MAX has superior cutting qualities.

3 The machinability of MO-MAX is unexcelled.

4 MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel.

5 MO-MAX is available in a standardized composition; also in cobalt and high vanadium varieties for special high speed steel requirements.

LEARN ALL THE FACTS! *Send for your copy of the MO-MAX Handbook, seventh edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.*

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio

An Important Announcement From The Ford Motor Company

Since 1923, we have manufactured and distributed the world-famous Johansson Blocks.

We now have completed negotiations for the sale of the Johansson Gage Division of the Ford Motor Company to Brown & Sharpe Manufacturing Company of Providence, R. I. Before this transaction was completed, we gave very careful consideration to the problem of finding a company with the skill and experience that would assure continued production of Johansson Blocks to the Johansson standards of quality.

The Brown & Sharpe Manufacturing Company has 115 years of experience in the making of precision tools, and after careful study, we decided that this experience, coupled with their standing in American industry have made them the sound choice to take over the manufacture of these precision gages.

All patents, methods and machines required for making Johansson Blocks become the property of Brown & Sharpe. Machinery and special steel stocks are being moved to Providence.

Meantime we will continue to provide Johansson Blocks from available finished stock here at Ford until Brown & Sharpe are in operation and ready to supply them.

FORD MOTOR COMPANY

ACCURACY

Efficiency

Economy

These three factors are the key-note of our special tools and machinery. Columbus Die-Tool builds and designs the tool for your particular purpose and will solve the toughest tooling problems effectively and promptly. Do not hesitate to consult our endless experience in this field.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

COLUMBUS DIE-TOOL and Machine Co.
925 CLEVELAND AVE.
COLUMBUS 1 OHIO

FREE LITERATURE

(Not good after September 1, 1948)

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 TOOLROOM LATHE—The American Tool Works Co., Cincinnati, Ohio. 58-page bulletin 10 describes the Pacemaker precision toolroom lathe. Illustrations, specifications, and drawings are given.

2 HONING MACHINES — Sunnen Products Co., 7910 Manchester Ave., St. Louis 17, Mo. 4-page folder MAN-1290 describes Sunnen precision honing machine with base, coolant pump, and belt guard for sizing internal cylindrical surfaces. Also offered are folders on toolroom mandrel sets, portable hones, stones, mandrels and accessories.

3 ENGINE, TOOLMAKERS LATHES—The Monarch Machine Tool Co., Sidney, Ohio. 36-page catalog 1112 covers the series 60 engine and toolmakers lathes and special accessories. Twelve design features are explained. Lathes are available in 14, 16-, 18-, and 20-in. swings, each in a variety of lengths.

4 MACHINING, REPAIRING DIESEL ENGINES—Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. 8-page bulletin compiles case histories of production of diesel-engine components with the use of horizontal boring, drilling, and milling machines. Advanced machining methods such as cylinder-boring time cut from 16 to 4 hours, are described.

5 DIELESS DUPLICATING MACHINES—O'Neil-Irwin Mfg. Co., Lake City, Minn. 8-page bulletin introduces the Di-Acro precision machines including: rod parter, offered in two sizes, bender No. 1-A, for large radii forming, shear No. 4 with a 24-in. capacity, punch, notcher with a 6x6-in. capacity in 16-gage steel, and radius brake No. 4 with a 24-in. capacity.

6 PRESSES—Danly Machine Specialties, Inc., 2100 South 52nd Ave., Chicago 50, Ill. 8-page bulletin illustrates and describes the 1-, 2-, and 4-point straightside presses. Presses offer internally ribbed frame, full eccentric gearing, precision-machined slide, disk-type clutch, and other features.

7 BALANCING MACHINES—Bear Mfg. Co., Industrial Div., 2016 Fifth Ave., Rock Island, Ill. 22-page bulletin explains dynamic-balancing machines for static and dynamic balancing of all rotating machine parts.

8 MILLING ATTACHMENT — Bemis & Call Co., Springfield, Mass. 4-page folder covers the Milmaster, a milling attachment for vertical milling and other machines. Attachment can be used for angle milling to 45° with cutters up to ½x4 in., for cutting racks, hobs, and broaches, and for other applications.

9 MECHANICAL PRESSES — Clearing Machine Corp., 6499 West 65th St., Chicago 38, Ill. 12-page bulletin illustrates and describes Series S and SD presses with capacities ranging from 60 to 250 tons, and widths ranging from 36 to 108 in.

10 HYDRAULIC AND AIR PRESSES—Logansport Machine Co., Inc., Logansport, Ind. 24-page bulletin 51 gives information including drawings and specifications of the Logan hydraulic and air presses.

11 DIAL-TYPE MILLING MACHINES—The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. 16-page bulletin M-1623 illustrates and describes the dial-type milling machines. Speeds and feeds indicated on direct-reading dials, are changed by power with a single finger-tip control lever. Three sizes are available each in two speed and feed ranges.

12 LATHES—The Carroll & Jamieson Machine Tool Co., Batavia, Ohio. 6-page bulletin 39-A-8 covers the C & J 16-in. 12-speed geared-head lathes. Machines are accurate within 0.001 in. in 14 in. Lubrication is provided through special oil reservoirs and tubes to bearings.

13 PRESS—DI Machine Corp., 2711 West Irving Park Rd., Chicago 18, Ill. Single pages and 4-page folder illustrates and gives specifications on the 12-ton Diebel hi-speed automatic press.

TOOLS AND ATTACHMENTS

14 CUTTING TOOLS—Reltool Corp., Milwaukee 3, Wis. 72-page catalog is offered covering Reltool metal-cutting tools. Catalog is indexed under the following classifications; end mills, special small end mills, end-mill holders, milling cutters, metal-slitting saws, special saws, miscellaneous.

15 CUTTERS—The Ingersoll Milling Machine Co., Rockford, Ill. 76-page catalog 56, spirally bound, describes in detail complete line of inserted-blade milling and boring tools with emphasis on a new series of carbide-tipped Shear Clear face mills for steel and cast iron.

16 DRILL JIG—Esco Engineering Co., Cleveland 12, Ohio, and distributed by Acme-Danneman Co., Inc., New York 12, N. Y. 16-page bulletin 49 covers the Esco line of standardized jigs, including over 50 standard styles and sizes.

17 COMPAIRATOR AIR GAGE—The Taft-Peirce Mfg. Co., Woonsocket, R. I. 6-page folder covers the Compairator air gage which is self-contained and includes filter and regulator. The single-dial cabinet is 7x8x7½ in. and weighs 12 lb.

18 CARBIDE CUTTING TOOLS—Wendt-Sonis Co., Hannibal, Mo. 60-page catalog 646 Revised, illustrates company's line of standard carbide cutting tools. Specification tables are provided. Catalog includes solid-carbide rotary files, grooving tools, adjustable reamers, inserted-tooth cutters, and other tools.

19 MULTIPLE-SPINDLE DRILL-HEADS — Thriftmaster Products Corp., Lancaster, Pa. 4-page folder contains information and drawings on the Thriftmaster gear-driven adjustable drillheads. Varied types are described.

20 NEW-TRONIC GAGES—Merz Engineering Co., Indianapolis 7, Ind. 6-page folder illustrates and describes various models of indicators. Also offered is a 4-page folder covering New-Matic measuring machines.

21 GAGE BLOCKS — Webber Gage Co., Cleveland 11, Ohio. 8-page pamphlet gives information on Webber micro-accurate gage blocks. Sizes and nontechnical information on processes used in their manufacture are given.

22 REAMERS—Pratt & Whitney, Div., Niles-Bement-Pond Co., West Hartford 1, Conn. 8-page folder 507 gives information on camlock adjustable serrated-blade reamers. Also offered is a 4-page folder 508 containing details on carbide-tipped high-speed-steel reamers.

HEAT TREATING AND WELDING

23 INDUCTION HEATERS — Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. 12-page bulletin 15B6430A gives information on heaters ranging from 1 to 100 kw. in size. Examples are given on brazing, soldering, hardening, annealing and heating operations.

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24 STANDARDIZED WELDING GUNS—Progressive Welder Co., Detroit 12, Mich. 12-page bulletin 402 gives information on standardized welding guns, combining standardized and interchangeable components. Standardized parts can be assembled on five basic types of gun chassis, to produce almost any gun shape desired.

25 ELECTRODE, PREHEAT CHART —Ampco Metal, Inc., Milwaukee 4, Wis. Bulletin W-19 gives recommended arc-welding electrodes for joining like or dissimilar metals, in charted form. Chart lists 31 alloys and shows which of 5 bronze electrodes is best suited for the welding application together with proper preheat for each application.

26 FLASH-BUTT WELDING MACHINES—Sciaky Bros., Inc., Chicago 38, Ill. 30-page bulletin 130-A presents information on Series BV and BMV flash-butt welding machines for mild steels, alloy steels, aluminum and other non-ferrous metals and alloys. Drawings and specifications are included.

27 HEATING, ANNEALING OF COPPER, BRASS—Surface Combustion Corp., Toledo 1, Ohio. 4-page bulletin SC-136 illustrates and describes heating and annealing of copper, brass, and other non-ferrous alloys in "Surface" furnaces. Recommended methods of heating and heat treating are discussed.

28 WELDING CAST IRON; GAS WELDING—Eutectic Welding Alloys Corp., New York 13, N. Y. 8-page bulletin entitled "Arc Welding Problems Successfully Solved," covers welding cast-iron, low- and high-alloy steels, stainless steel and tool steels to high-carbon steels; welding special manganese parts, and other problems. Second bulletin entitled "Another Major Advance in Gas Welding," covers developments in special flux-coated alloys known as EutecRods, for steel, cast iron, brass and aluminum.

29 CABLE CONNECTIONS FOR ELECTRIC WELDING — Tweco Products Co., Wichita 1, Kansas. 12-page bulletin describes line of Tweco welding electrode holders, ground clamps, cable connectors, machine terminals and other parts.

PLANT SERVICE EQUIPMENT

30 PALLET TRUCKS—The Yale & Towne Mfg. Co., Philadelphia, Pa. 20-page bulletin illustrates and describes pallet-system applications, hand-lift and Worksaver pallet-truck models, and recommended pallet design.

31 PUMPS—Nagle Pumps, Chicago Heights, Ill. 36-page bulletin 4711 gives information on most recent developments of company's line of horizontal- and vertical-shaft centrifugal pumps. Applications include pumping corrosive and hot liquids and abrasive or heavily laden mixtures.

32 STENCIL-ETCHING PROCESS—Lectroetch Co., Cleveland 12, Ohio. 4-page folder illustrates and describes the Lectroetch electrolytic stencil-etching process for parts marking. System marks any finished metallic surface without strain or deformation of finished surface.

33 BATTERIES FOR INDUSTRIAL TRUCKS—Gould Storage Battery Corp., Trenton, N. J. Two 6-page pamphlets GB-573 and GB-574 include information on the Gould Thirty and Kathanode batteries. Engineering specifications are included.

34 COMPRESSORS — Quincy Compressor Co., Quincy, Ill. 16-page bulletin lists varied types of compressors with specifications and features of each. Information on accessories is included.

35 ELECTRIC HOISTS—Lisbon Hoist & Crane Co., Div. Wright File Co., Lisbon, Ohio. 8-page folder contains information on additional models to the line of Bob-Cat electric hoists. Motor is made in three sections, and is mounted on the inside of the cable drum.

PARTS AND MATERIALS

36 GRINDING, FINISHING — Minnesota Mining & Mfg. Co., Saint Paul 6, Minn. 16-page bulletin entitled "Step Up Production," illustrates and describes the 3M backstand method of polishing and grinding. Equipment necessary is a standard polishing lathe, free-running adjustable-idler pulley, 3M abrasive-cloth belts, contact roll of proper density.

37 ELECTRICAL MACHINERY — Fairbanks, Morse & Co., Chicago 5, Ill. 48-page booklet E100G is entitled "Catechism of Electrical Machinery." Booklet presents theoretical and practical features of common types of dc. and ac. motors, generators, and control equipment.

38 COMPUTER OF CORROSION RESISTANCE—The H. M. Harper Co., Chicago 18, Ill. Slide calculator gives corrosion resistance of brass, bronze, copper, monel metal, and stainless steel. Agent is set in one window and corrosion resistance is read in another window under the alloy.

39 SNAP-ACTION SWITCHES — Acro Electric Co., Cleveland 14, Ohio. 24-page catalog describes line of Acro bakelite-enclosed and open-blade type switches in a wide variety of shapes, sizes, and operating characteristics.

40 VINYLITE RESINS AND PLASTICS—Bakelite Corp., Unit of Union Carbide and Carbon Corp., New York 17, N. Y. 38-page bulletin J-547a contains information on forms, properties, and applications of these resins and plastics.

41 INCREASING WIRE-FORMING, -STRAIGHTENING EFFICIENCY—Adamas Carbide Corp., Long Island City 1, N. Y. 4-page folder describes typical applications where wearing qualities of Adamas tungsten carbide can increase overall efficiency for users of wire and wire products.

42 STAINLESS PLATES—Allegheny Ludlum Steel Corp., Pittsburgh, Pa. 30-page bulletin covers stainless plates, solid and clad, and their fabrication. Bulletin is sectionalized for reference.

43 FLEXIBLE HOSE—Titeflex, Inc., Newark 5, N. J. 22-page bulletin illustrates and describes the Titeflex all-metal flexible hose. In addition to brass tubing, bulletin covers company's new bronze tubing for nominal steam-pressure applications, monel and stainless-steel tubing for higher temperatures and corrosion resistance, and inconel tubing for high temperatures.

44 JOINTS—Barco Mfg. Co., Chicago 40, Ill. 18-page pamphlet covers company's line of flexible ball joints, insulating joints, swivel joints, and adjustable-type revolving joints.

45 FELT WHEELS AND CONES—W. F. Bollen Co., New York 17, N. Y. 4-page pamphlet illustrates and describes company's polishing supplies, including felt wheels and cones. Specifications are given.

46 TOOL AND DIE ACCESSORIES —Standard Machinery Co., Providence 7, R.I. 8-page bulletin DA covers company's tool and die accessories, including socket cap and set screws, pressure-pad stripper and knock-out springs, and hardened and ground dowel pins.

47 STANDARD ANALYSES OF STEEL AND METALS—Calumet Iron & Supply Co., East Chicago, Ind. 30-page booklet spirally bound is a reference book of standard weights, gages, measures and analyses of steel and metals.

MISCELLANEOUS

48 INDEX TO ASTM STANDARDS —American Society for Testing Materials, Philadelphia 3, Pa. 240-page revised copy as of Dec., 1947, issued May, 1948. All items are listed under appropriate key-words according to particular subjects covered.

49 BRIDGING THE GAP—The Herbert D. Hall Foundation, Newark 5, N. J. 8-page folder explains the work of the Foundation. Five objectives are noted: economic education, human and industrial relations, visual education, vocational guidance, and improved technical education.

50 WORKING CAPITAL FOR INDUSTRY—C.I.T. Corp., New York 16, N. Y. 12-page bulletin presents a case history which points out a possible solution to industry's need for working funds. The history is based on The Monroe Auto Equipment Co., Monroe, Mich.

51 DECIMAL-FRACTION CALCULATOR—Wendt-Sonis Co., Hannibal, Mo. Calculator adds and subtracts fractions. Instructions for correct use are printed on the back.

52 THE WILLYS - OVERLAND FORGE — Willys-Overland Forge, Willys-Overland Motors, Inc., Toledo, Ohio. 24-page bulletin describes company's facilities. Included is a step-by-step picture of operations.

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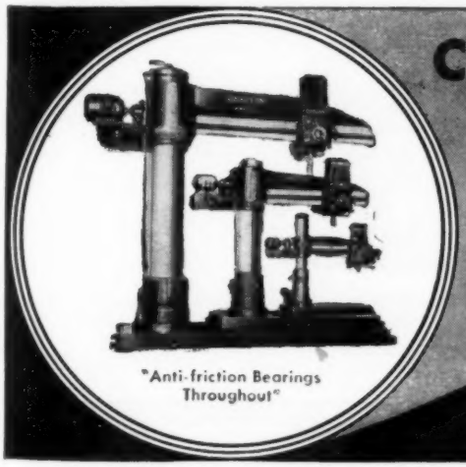

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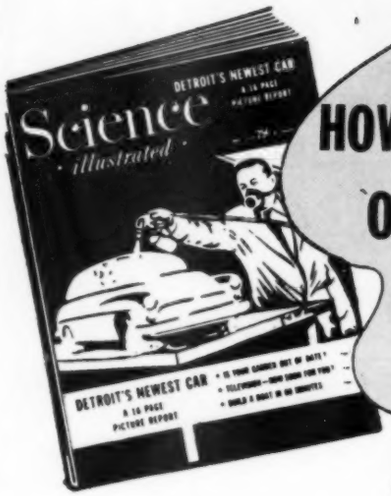

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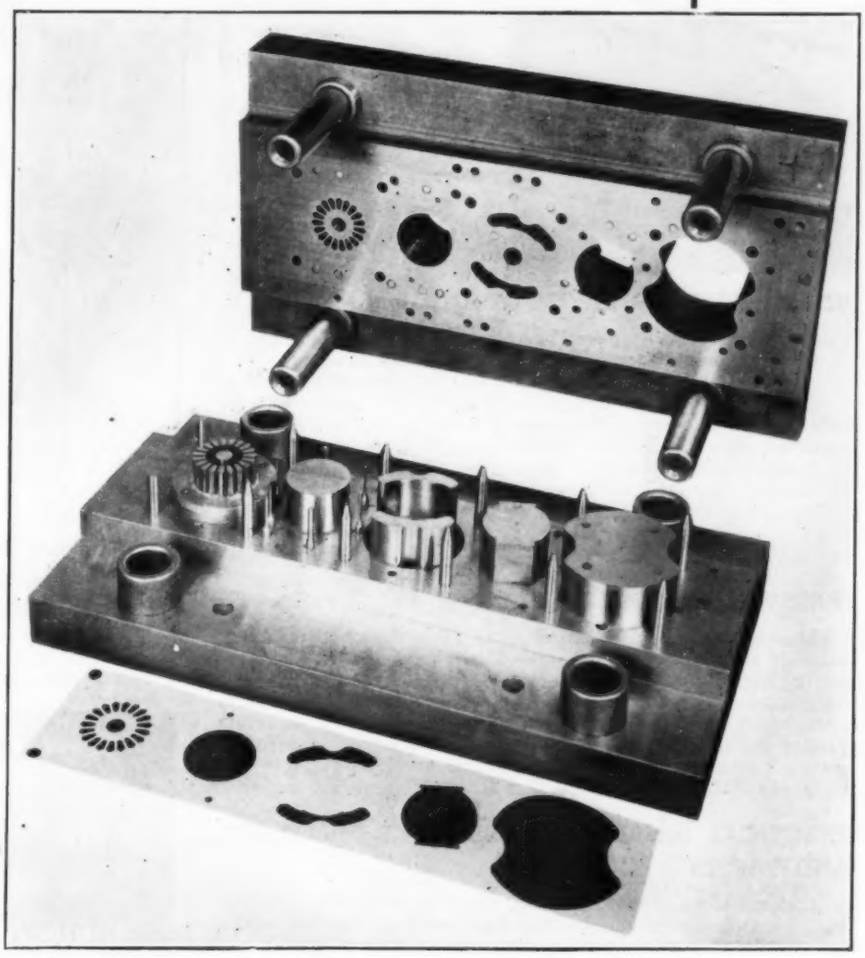

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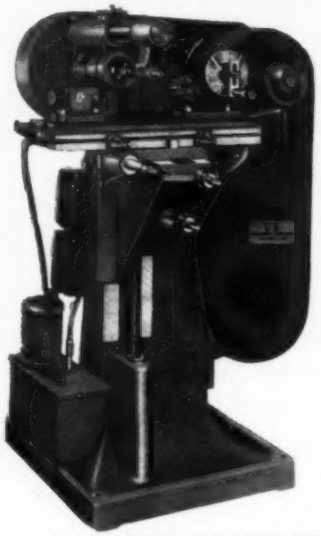

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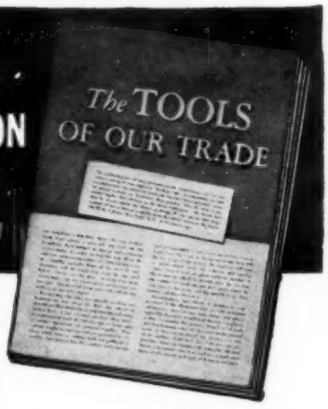

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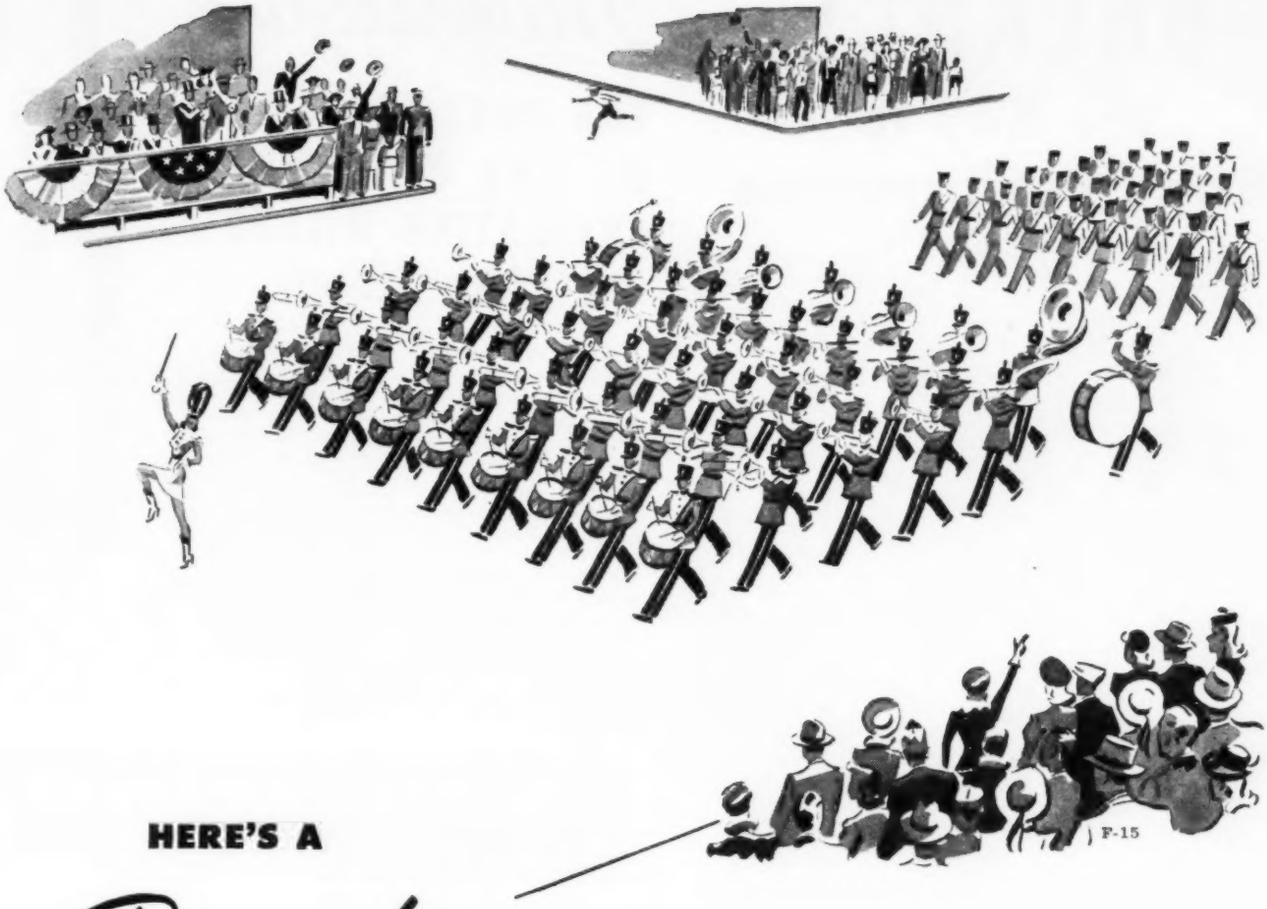

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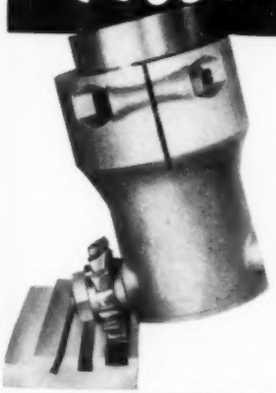

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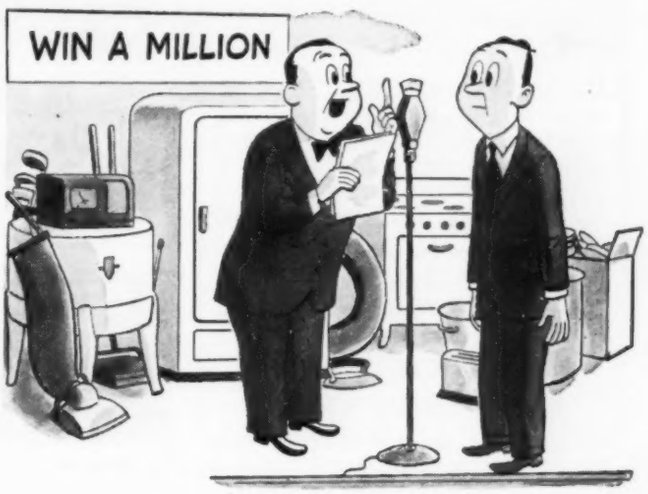

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AUCTION ADVERTISING
ON PAGE 219

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32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond, Motorized
24"x22' Lodge & Shipley, Geared Head.
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American, Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20"x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x10' Davis, Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, MD.
16"x8' Hendey, Q.C.G. M. Drive
16"x6' Lodge & Shipley Geared Head
14"x8' Rockford, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
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13"x5' South Bend Q.C.G. 30" centers
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12"x5' Sidney, Geared Head
12"x5' Hendey, Q.C.G. M. Drive
12"x5' Sebastian Q.C.G. Grd. Hd.
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Simmons Microspeed 1" Cap., M.Dr.
Oster #601 Hand Screw Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M.Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1½" cap., M.Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2½" Cap., M.Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.

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Niagara, initial type 12' x ⅛"
Hendley-Whitmore 6' x 3/16"
Dekom Angle Bending, 3 x 3 x ⅜, M. Dr.

GRINDING MACHINES

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Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 30" Vertical Surface
Thompson Hydraulic Horiz. Surface
Abrasive Automatic Surface, 22x8
Reid #2 Automatic Surface, 6x18
Norton Hydraulic Horiz. 6x36
Heald #25 Rotary Surface
Seybold 96" Knife, belt driven
Brown & Sharpe #2 Face, motorized
Rivet #3 Internal, Cone driven
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
Cincinnati #1½ Univ. Tool & Cutter, Belt Dr.
Oakley #3 Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Gorton Dble. End Disc, 18" dia. discs
Besley Dble. End Disc, 30" dia. discs
Greenfield #12 Internal Hydraulic
Cincinnati #2 Univ. Cylindrical 6x36
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical

MILLING MACHINES

Vernon #0 Hand, Late Type, M.D.
Nichols Hand, Late Type, M.D.
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Bickett #1 B.B. Vertical, Bench
Ames Universal Horiz. Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical
Cincinnati #2 Univ. Horizontal
Cincinnati #3S Univ. Horizontal
Cincinnati #3, #4, #5 Pl. Horiz.
Cincinnati #2M Univ. Horiz.
Brown & Sharpe #0, 1, 1Y Horizontal
Brown & Sharpe #2 Univ. Horiz.
Brown & Sharpe #1D Univ. Horiz.
Brown & Sharpe #3 Univ. Horiz.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Garvin #14 Plain Horizontal
Milwaukee #2K Vertical, M. Dr.
Milwaukee #3K Vertical, M. Dr.
Milwaukee #1½ Dble. Overarm, Horiz.
Milwaukee #2B Dble. Overarm, Horiz.
Milwaukee #2B Universal Horiz
Milwaukee #3B Plain Horizontal
Brown & Sharpe #12 Production, M.Dr.
Pratt & Whitney #2 Duplex, Motorized
Van Norman #2 Duplex, Motorized
Cincinnati #0-8 Vertical, M. Dr.
Cincinnati #0-8 Plain Automatic
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Cincinnati #2-18 Plain Automatic

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Caldwell 200 tons Horiz. Hydr. Wheel Press.
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General Flexible Power Press. 8 tons, M. Dr.
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Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dble. Action, Gap Frame. Floor Model. Bolster Plate.
Lucas 15 tons Power Arbor Press. M. Dr. Floor model with tables
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Tompkins & Johnson Power Arbor Press. 3½" Stroke. Cap. 6500# Press
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NEW Johnson O.B.I. Presses. All sizes.

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Fosdick, 5' arm, 14" col. Radial, M. Dr.
Cinci.-Bickford, 6' arm, 15" col. Radial. M. Dr. #5 M. T. Motor Drive
Demco 4-Spindle. Drill No. 2 m.t. M.
Pratt-Whitney 2-Spindle. Profiler. M. Dr.
Barnes 22" Sgle. Spdle. Drill Power feed
Natco No. 12, 20 Spdles. 3/16" Cap.
Fox No. 15, 54 Spdles. No. 1 m.t.
Minster No. 2D, Sgle. Spdle. Upright, compound table, No. 5 m.t., heavy duty. 2½"

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Logan 7" Horiz. Shaper, Motor Drive
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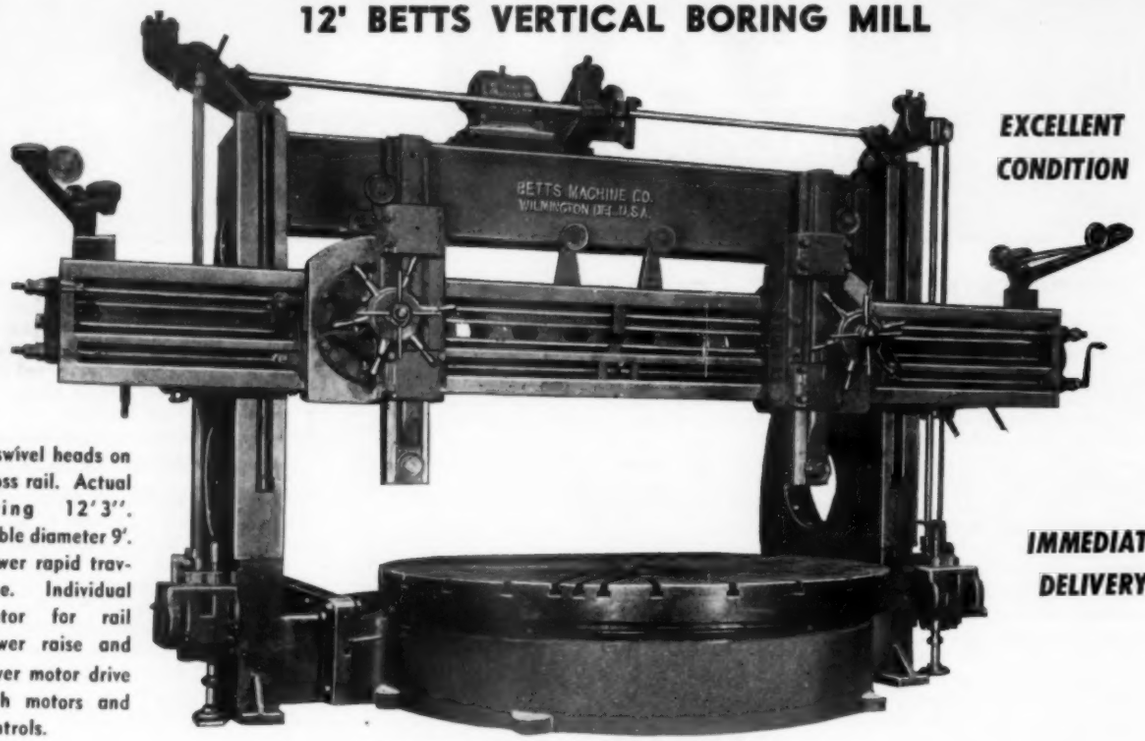
American 24" Crank Shaper, Motor Dr. 3/60/220/440 Volts. Turner Drive
New Haven 12" Vertical Slotter
Whitcombe, 24x24x6 Planer
Niles-B-P. Shaper Planer, 20x20x24
Betts, 120"x72"x35' Planer

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff Machine
#2 Brown & Sharpe High Speed Automatic. Turner Drive with motor 3/60/220/440
1—1¼" Cone 4-spindle Automatic M.D. Threading Spindle

12' BETTS VERTICAL BORING MILL



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36" & 42" BULLARD Vert. M.D. Spiral Drive
No. 44 UNIVERSAL "Tri-Way" Table Type
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No. 4H LANDIS 4"x18" Plain Grinders
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6"x30" NORTON Type C Plain, M.D.
10"x18" LANDIS Type C Plain, M.D.
10"x72" NORTON Type C Plain, M.D.
12"x48" CINCINNATI Model ER Univ. M.D.
14"x36" LANDIS Type C Plain, M.D.
24"x96" NORTON Plain, M.D.

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6"x10"x18" THOMPSON Type F Hyd. M.D.
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No. 11 BLANCHARD Rotary, 16" chuck, M.D.

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No. 2 CINCINNATI Cutter & Tool, M.D.
No. 4T SELLERS Tool, M.D.
No. 72A3 HEALD Plain Internal, M.D.
9" P&W Hyd. Gear, M.D.
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16"x78" cc AMERICAN "PACEMAKER", M.D.
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No. 2G KEMPSMITH All Geared Univ., M.D.
No. 2 HS CINCINNATI Dial Type Vert., M.D.
No. 2H KEARNEY & TRECKER Vert., M.D.
No. 4MS CINCINNATI Dial Type Plain M.D. (2)

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No. 2-24 CINCINNATI Auto. M.D.
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No. 5/60 CINCINNATI Duplex Hydro tracer control mechanism for auto. rise and fall of spindle carriers, M.D.

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No. 0 B&S Feed Screw, M.D.
No. 2G MOREY Turret Lathe, M.D.
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Nos. 3, 4 & 5 WARNER & SWASEY Ram Type Univ., M.D.
Nos. 3 & 5 JONES & LAMSON Ram Type Univ., M.D.
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20" BARNES "Camel Back" Upright Drill
Type MA-8 AVEY 4 spdle Floor Type, M.D.
6-spdle ALLEN 5 power feed spindles, belted M.D.
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3'11" AMERICAN "HOLE WIZARD" Radial, M.D.
No. 3 Type MA-6 AVEY Single Spindle, M.D.

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LINDBERG Type HYT Tubulaire Hydryzing Furnace
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4 spindle 1¼" Cone, m.d., latest
1⅝"—8 spindle Cone, m.d., latest
No. 4D Potter — Johnston, m.d., latest
No. 5D—12"—2 spindle Jotter & Johnston, m.d., latest
No. 5D—2—15" Potter & Johnston, m.d., latest
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, m.d.
20x25" Jones & Lamson, m.d., latest
4 spindle ⅞" Cleveland Model M, m.d., bar
4 spindle ⅞" Model R-4 Acme-Gridley, m.d., bar
4 spindle 2" Cleveland Model M, m.d., bar
4 spindle 2¼" Cleveland Model K, m.d., bar
2¼" Gridley, m.d.
2½", 4¼", 4½", 5½", 6", 7¾" Cleveland Model A, m.d.

BOLT THREADING MACHINES

¾" Economy Stle R Automatic, belt
2 spindle 1¼" Landis Geared Head, m.d.
3 spindle 1¼" Acme, cone

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No. 25T Giddings & Lewis, 2½" bar, m.d., latest
Morris Mar-Speed Drilling & Tapping, m.d.
2½" bar Cleveland, m.d.
No. 31 Lucas, m.d., 3" bar
No. 33 Lucas, m.d., 4½" bar
No. 45 Giddings & Lewis, m.d., 5" bar
4" bar Detrick & Harvey Floor Type, m.d.
4" bar Landis Floor Type, m.d.
5½" bar Niles, m.d.
10" bar Sellers, m.d., floor type

VERTICAL BORING MILLS

24", 36", 42" Bullard New Era, m.d., with side head
36", 42" Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., m.d., 2 rail heads
48" Cincinnati, m.d., 1 swivel, 1 turret head
48" Colburn, m.d., 1 swivel, 1 turret head
48" Putnam H.D., 2 swivel heads, m.d.
52" King, m.d., 2 swivel heads
54" Colburn, m.d., 1 turret, 1 swivel head
84" Niles H.D., 2 swivel heads, p.r.t.
100" Niles Heavy Pattern, m.d., 2 swivel heads, p.r.t.
100" Niles Extra Heavy Pattern, m.d., p.r.t., 2 swivel heads, late type
120" Niles Heavy, m.d., p.r.t., 2 swivel heads

BROACHING MACHINES

Cincinnati Milling Mach. Co. Mill Broach, m.d., 10" spindle
No. 4 LaPointe of Hudson, gear box
No. 4 Oil Gear Hydraulic type XA, 64" stroke, m.d.
No. 75 H.P. LaPointe Hydraulic, 37½ tons, 150" stroke

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Walker-Turner Bench Type, m.d.
No. ½ Avey, m.d.
No. 1B Edlund, m.d., new
No. 5M, 16" Fosdick, m.d.
2 spindle No. 3 Avey, m.d., tapping
2 spindle 21" Canedy-Otto, m.d.
2 spindle No. 3 Edlund, m.d.
3 spindle No. ½ Avey, m.d., latest
3 spindle No. 2 MA6 Avey, latest
4 spindle No. 2 Avey, m.d.
4 spindle No. 2 Avey MA6, latest
6 spindle No. 2B Edlund, m.d.
6 spindle Henry & Wright Class B, m.d.
6 spindle Leland & Gifford, m.d.

HORIZONTAL DRILLS

No. ½Bx50" Pratt & Whitney 2 spindle Gun Drill, m.d., latest
No. 1Bx50" Pratt & Whitney 2 spindle Gun Drill, m.d., latest
No. 1Bx50" Pratt & Whitney Horizontal Reaming Machine, m.d., latest
No. 1 Pratt & Whitney 2 spindle Gun Drill, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Drill, m.d., latest
Pratt & Whitney Rifling Machine, belt
Barnes 2 spindle Deep Hole Drill, m.d., late
5 spindle Detroit Semi-Automatic Drill, belt

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, 12 spindles
No. 3 Baush, m.d., 20x40" head, 15 spindles
P7 Baush Hydraulic, 20x30" head, 12 spindles, m.d.
D13H Natco, m.d., 18x12" head, 10 spindles
No. 16 Fixed Center Foote-Burt, m.d., 8 spindles
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, m.d.

TURRET LATHES AND SCREW MACHINES

No. 1H6 Libby, m.d., chucking, latest
No. 1 Cincinnati Acme Semi-Universal, m.d., bar
No. 1 Cincinnati-Acme, chucking
No. 1L, 2L, 3L Gisholt, m.d., chucking, standard and long bed types
No. 1, 2A, 3A Warner & Swasey Universal, m.d., bare
No. 1A, 2A, 3A Warner & Swasey Universal, m.d., chucking
No. 1A Warner & Swasey Universal, m.d., chucking, pre-selector head, latest
No. 2 Cincinnati Acme Full Universal, m.d., chucking, latest
No. 2B Foster Universal, chucking
No. 2G Morey Ram Type, bar
No. 2 Warner & Swasey All Geared Head Ram Type, m.d., bar
No. 2A Warner & Swasey Universal, m.d., chucking, Timken
No. 3 Cincinati Acme Full Universal, m.d., chucking
No. 3, 5 Foster All Geared Head, m.d.
No. 3B Foster Universal, m.d., bar
No. 3L Gisholt, m.d., with cross-sliding turret, chucking
No. 3, 4, 5 Warner & Swasey, m.d., pre-selector head, bar and chucking types, Timken, latest type
No. 3A Warner & Swasey Universal, m.d., chucking, latest
No. 4-R Cincinnati Acme, m.d., bar
No. 4 Gisholt Universal, m.d., chucking, Timken
No. 4 Warner & Swasey Plain, cone, motorized
No. 4 Warner & Swasey Universal, geared head
No. 4A Warner & Swasey Universal, m.d., chucking 8" hole, Timken, latest
No. 4A Warner & Swasey m.d., chucking, 7½" hole, Timken
No. 5 Bardons & Oliver Universal Ram Type, m.d, chucking
No. 5 Foster All Geared Head Universal, m.d., chucking
No. 7 Bardons & Oliver Universal Ram Type, m.d., chucking
No. 7 Bardons & Oliver, cone
2½x24", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head Turret, m.d., bar and chucking types
2½" Jones & Lamson Universal Saddle Type, m.d., bar, late
3¼" Cincinnati Acme Geared Head Flat Turret, m.d., chucking
18" Libby Type A, m.d.
20" Acme, cone
24", 28" Gisholt, cone
26" Libby Type C Turret, m.d., chucking
No. 5 Woods Tilted Turret, Model D, cone

SHAPERS

24" Gould & Eberhardt Invincible, m.d.
24" Gould & Eberhardt High Duty, m.d.
24" Potter & Johnston, cone

RADIAL DRILLS

3'-9" column American Triple Purpose, m.d. on arm
3' American Sensitive, belt
4' American Sensitive, m.d. on arm
4'-12" Fosdick, gear box on base
4'13" American Triple Purpose, gear box on base
4' Niles-Bement-Pond Semi-Universal, m.d.
5'-13" American Triple Geared, m.d.
5'-15" American Triple Purpose, gear box on base
5' Cincinnati-Bickford Full Universal, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5'-13" Cincinnati-Bickford, gear box
5'-13" Cincinnati-Bickford, d.c. motor
5' Prentice, m.d.
6'-15" Carlton, gear box
6'-15" Cincinnati-Bickford, m.d.
6'-15" Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
7'-17" Dreses, gear box
8'-19" American Triple Purpose, m.d. on arm, p.r.t., late type
8'-16" American Triple Purpose, m.d. on arm
10'-22" American Triple Purpose, m.d. on arm, p.r.t.

UPRIGHT DRILLS

20" Barnes All Geared Self-Oiling, m.d.
21" Cincinnati-Bickford, m.d.
24" Cincinnati-Bickford, belt
25" Cleereman, m.d., latest type
30" Rich H.D.
H3 Barnes Hydram, m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., m.d.
No. 25 Foote-Burt, m.d.
No. 36 HO Baker H.D., m.d., with 40" circular table
No. 217 Baker H.D., s.p.d.

GEAR SHAPERS

No. 6, 61, 645 Fellows, belt
No. 7, 7A Fellows High Speed, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61A, 65A3, 615A, 645A3 Fellows, m.d., latest type, pract. new
No. 64-S Fellows, m.d.

GEAR GRINDERS

No. 13LS Fellows Gear Lapper, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d., 12" cap.

GEAR HOBBERS

Model T Barber-Colman, m.d., latest
No. 12H Gould & Eberhardt Universal, m.d., p.r.t.
No. 34 Brown & Sharpe, m.d., for spur gears
No. 36H Gould & Eberhardt, m.d., with automatic infeed attachment for worm gears
No. 44 Brown & Sharpe, m.d., for spur and spiral
48" Cleveland, m.d.

GEAR CUTTERS

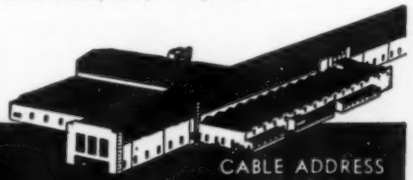
3" Gleason Straight Bevel, m.d.
No. 3—26" Brown & Sharpe Spur, m.d.
No. 4—48" Brown & Sharpe Spur, m.d.
No. 6—72" Brown & Sharpe Spur, m.d.
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Red Wing Gear Speeder, m.d., 10" cap.
Gleason Gear Tester for gears ground on No. 7 Gleason Hypoid Grinder

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle, latest
No. 2 Cincinnati, m.d., older types
Cincinnati Valve Seat Grinder, cap. ⅜" valve stems
Long bar attachment for No. 3 cap. ¼"x18' long

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 15" spindle, new
No. 50 Heald Hydraulic, m.d., 11-18" spindle
No. 73 Heald Airplane Cylinder, m.d., brand new, 1944 machines
No. 55 Heald, m.d., 15" spindle



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Late Type—EVERY MACHINE TESTED AND GUARANTEED AS REPRESENTED—*Immediate Delivery*

LATHES

SOUTH BEND, 14"x6', 16"x10', 10"x3½'
BRADFORD, 14"x6', 16"x6', 16"x8'
PUTNAM, 28"x12', M.D.
CLAUSING, 12"x5', M.D.
HENDEY, 16"x6', 16"x8', taper attach.
RIVETT, No. 608 taper attach. precision
LE BLOND 24"x15', M.D.
BRIDGEFORD, 26"x34"x17', taper attach.
LE BLOND 'REGAL', 13"x5', 17"x6', 17"x9'
HARDINGE, 1" cap. second operation
ELGIN & HARDING PRECISION, 1" cap.
PRATT & WHITNEY, 10"x20", precision
PRATT & WHITNEY, 13"x6', taper attach.
SIDNEY, 18"x10', taper attach.

TURRET LATHES

WARNER & SWASEY #5 Universal, Preselector, Bar & chucking. Serial 622285
MOREY #3 Universal, Bar & chucking (1945)
GISHOLT #3 bar equip. preselector
GISHOLT #1L, air cylinder
WARNER & SWASEY, #1A chucking
FOSTER, #5 universal, bar feed
SIMMONS MICRO-SPEED, 1¼" cap, bar feed
WARNER & SWASEY #1, ⅝" cap.
BROWN & SHARPE, hand screw, #0, #1

GRINDERS

BROWN & SHARPE #2 Universal. Serial 4917
BROWN & SHARPE #13 Tool & Cutter
NORTON #2 Universal Hydraulic Tool & Cutter
BROWN & SHARPE, #13 universal
COVEL, #91A, tool & cutter universal
CINCINNATI, #2 centerless, Filmatic
LANDIS, cylindrical, type H, 4"x12"
CINCINNATI, cylindrical, 6"x18", FILMATIC, HYD.
HEALD, #72A3, plain internal, HYD.
BLANCHARD, VERTICAL SURFACE, #16, 26" chuck
BLANCHARD VERTICAL SURFACE, #11, 16" chuck
ABRASIVE, VERTICAL SURFACE, #33, 8x24"
MATTISON, SURFACE, 14"x16"x60", hyd.
BROWN & SHARPE, #5 surface, hyd.
THOMPSON, SURFACE, 6"x18", hyd.
BROWN & SHARPE, SURFACE, #2B
REID, SURFACE, #2B, #2-3, Pope spindle
Excello Thread Grinder #31
Jones & Lamson Thread Grinder, 12"x45"

SHAPERS

Cincinnati 24" latest heavy duty
American 21" M.D.
Gould & Eberhardt, 16", 20" Industrial
Stockbridge, 16", M.D.
Pratt & Whitney, Vertical 6", M.D.
Atlas on steel bench 7", M.D.
Shaperite floor model 8" NEW

DRILL PRESSES

American Radial, 4'x11" column
Avey, 2sp. #MA6, #3 taper
Buffalo, 2sp. #22, #4 taper
Avey, #2 single spindle, 15" overhang
Leland-Gifford, #2, single spindle
Allan, 6 spindle, #2, 12" overhang
Champion 24", backgeared, #4 taper
Natco, multi-spindle, #D5
Canady-Otto drills 4sp. NEW
Canady-Otto, 17" Roller bearing
Morris-Mor-Speed Radial 3' arm 9" column

PLAIN MILLERS UNIVERSAL

AMES, UNIVERSAL, PRECISION, BENCH
BROWN & SHARPE, #3A, UNIVERSAL
BROWN & SHARPE, #3B, PLAIN
BROWN & SHARPE, #3, UNIVERSAL
CINCINNATI, #2MH, Universal
KEARNEY & TRECKER, #1B, S.P.
BROWN & SHARPE #2 Light Type, Vertical Head

VERTICAL MILLERS

CINCINNATI, #3, #4, dial type
VAN NORMAN, #3V, rapid traverse
KEARNEY & TRECKER, #2KM, dial type
KEARNEY & TRECKER, #3KM, dial type
KEARNEY & TRECKER, #3H, dial type
BRIDGEPORT, POWER FEED to table

PRODUCTION MILLERS

PRATT & WHITNEY thread miller, 4½"x12"
WALTHAM thread miller, ext. & int.
CINCINNATI, #4-48 hydromatic
CINCINNATI, #1-12 automatic
KEARNEY & TRECKER, #1H-18 Mfg. type
SUNDSTRAND, #2 Electromill, 24" travel
BROWN & SHARPE, #000, high speed

GEAR MACHINERY

GOULD & EBERHARDT #2H Universal, Spur & Helical
BARBER-COLMAN MODEL, Type A—#3
HAMILTON, SWISS-TYPE, #1 hobber
FELLOWS #61A, Model—712
GLEASON, 18" cap. straight bevel
GOULD & EBERHARDT, #735, spur gears

AUTOMATIC SCREW MACHINES

BROWN & SHARPE, #0G, ⅝" cap.
BROWN & SHARPE, #2, high speed
BROWN & SHARPE, #2, with slotter
BROWN & SHARPE, #00, high speed ⅜" cap.
New Britain, #61, 2¼" cap.

BOREMATICS AND BORING MILLS

Defiance #25A Horizontal 3¾" Bar
Bullard, Spiral Drive 36" Vertical
Excello #2112A, double head
Heald #48A, double head used 2 weeks
Heald #48A, single head

PRESSES, SHEARS, BRAKES

Niagara #310, 10'x16 gage NEW
Niagara 6'x10 gage, 16" gap
Verson 6'x45 ton cap. press brake
Famco Shears, 36", 52" NEW
Consolidated Press #3, tie rod, M.D.
Ferracute Press #C3, inclinable
Double Crank Press, 40 ton cap.
Zeh & Hahnemann, 10 ton roll feed
Erie hydraulic 750 ton like new
Diebel Hi-speed and roll feed
Hydraulic Press 25 ton to 750 ton

MISCELLANEOUS

Baker Keyseator #1, M.D.
Riveting Hammers, high speed #1½B, #5A
Spot Welders 5 KVA to 100 KVA
Famco Foot Presses, #6, #8, #10, #12, #15
BUTTERFLY Filing machines
Porter Cable belt sanders
Flexible Shaft Grinders
Machinery for Sheet Metal trade

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HEADLINERS

LATHES

14"x6' HENDEY Yoke Head, AC self-cont. drive, univ. relieving attach.
14"x6' AMERICAN 12-speed Grd. Hd. AC MIB, taper
14"x8' AMERICAN 12-speed Grd Hd, AC MD, taper
17"x8' SIDNEY, Lima Drive, taper
18"x6' LODGE & SHIPLEY Selee Grd Hd, AC MD
20"x6' SEBASTIAN Model R, AC MIB, new 1947
20"x10' LODGE & SHIPLEY Selee Grd Hd, AC MD
20"x8' LODGE & SHIPLEY Selee Grd Hd, AC MIB, taper
22"x10' ROCKFORD 3 SCD DBG QC
24"x12' BOYE & EMMES, Turner Drive, AC MD
24"x14' LODGE & SHIPLEY, Turner drive, taper

MILLERS

#1 CINCINNATI Univ., 4 SCB BG
#2 KEMPSMITH Univ., AC MD, div. hds., vert. hd.
#2 CINCINNATI H.P. Plain, AC MD
#2B BROWN & SHARPE Heavy Plain, AC MD, PRT
#2B MILWAUKEE Plain, DOA, AC MD
#2B MILWAUKEE Univ. DOA, SPD
#2M CINCINNATI Plain, Rect. O.A., AC MIB
#4 CINCINNATI Univ. H.P., Lima Drive
#4B BROWN & SHARPE Plain, AC MIB, DOA
#14 COCHRANE-BLY Univ. Vert. Miller & Shaper, AC MD
#40H INDEX Vert. PF to table, AC MD

SHAPERS & PLANERS

48"x48"x18' PUTNAM Hvy. Duty Planer, with A.C. Mtr. 4 Hds.
14", 16", 20" & 24" GOULD & EBERHARDT H.D.
24" MILWAUKEE V-ram, Lima AC MD
28" AMERICAN H.D., arr AC MD
30"x30"x8' CINCINNATI, AC MD
36"x36"x16' GRAY, 4 hds, AC MD

RADIAL DRILLS

2' & 3' AMERICAN Triple Grd. gearbox
3' CINCINNATI-BICKFORD, AC MD
4' MORRIS, MD
6' CINCINNATI-BICKFORD, mtr on arm
7' DRESES, AC MD thru gearbox

GRINDERS

#16—26" & #16—30" BLANCHARD Vert. Spdl. AC MD
#2 BROWN & SHARPE Univ., factory AC MD
#4 GARDNER BB Disc, 23", AC MD, new 1942
#24—53" GARDNER Vert. Spdl Disc. arr MD

TURRET LATHES

#2B FOSTER Univ. Grd Hd, SPD
#3A WARNER & SWASEY Univ., AC MD, Timken
#4 WARNER & SWASEY Univ., AC MIB. Timken
4W CINCINNATI-ACME Univ., AC MD, threading attach.
#5 WARNER & SWASEY Univ., AC MIB

MISCELLANEOUS

#43 LUCAS Horz. Boring Mill, AC MD, 4½" bar, 20' betw. faceplate and outboard support
10'x10 ga. Geo. Ohl Power Press Brake, AC, MD
#642 NIAGARA 42"x10 ga. Shear

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SETS OF HIGH SPEED DRILLS

#1-60 HS Drills, 60 Drills W/Stand Set $10.00

1/16"-1/2" HS Drills, 29 Drills W/Stand Set $13.50

A-Z HS Drills, 26 Drills W/Stand Set $12.50

½"-1" HS Drills by 64ths, Straight or Taper Shank, 33 Drills Set $65.00

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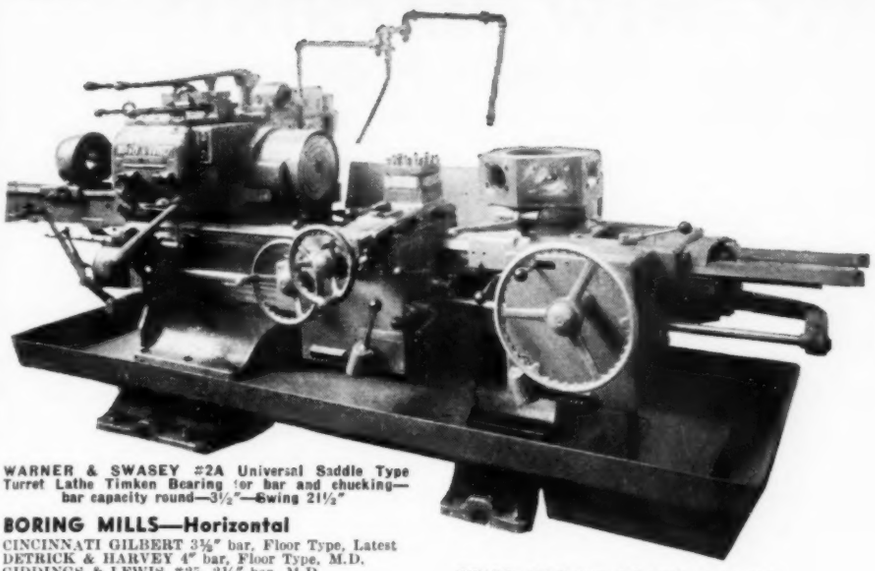
LATEST TYPE NEARLY NEW MACHINES



WARNER & SWASEY #2A Universal Saddle Type Turret Lathe Timken Bearing for bar and chucking—bar capacity round—3½"—Swing 21½"

BORING MILLS—Horizontal

CINCINNATI GILBERT 3⅛" bar, Floor Type, Latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #25, 2½" bar, M.D.
GIDDINGS & LEWIS #32, 3⅛" bar, M.D.
HEALD #48A Single End, 2-spindle, Latest Type
HEALD #49 Universal, Single End, Latest Type
LANDIS #35, 3⅛" bar, Floor Type, M.D.
LUCAS #41—3" bar, Table Type, Latest Type
NILES BEMENT POND 5", 6" bar, Floor Type, M.D.
P & H #10 3⅛" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed, Latest Type
UNIVERSAL No. 3A, 3" bar, M.D.

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BULLARD 16"—6 & 8 spindle, Mult-Au-Matic, Type D, Latest Type
KING 62"—2 swivel heads; P.R.T.—M.D.
NILES 72" 2 Swivel heads, PRT, M.D.
NILES 84" 2 Swivel heads, PRT, M.D.
NILES 100" 2 Swivel heads, Heavy, M.D.

GEAR CUTTING EQUIPMENT

BARBER COLMAN #12 hobber, M.D.
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS #75, #725, #615A, #61, #7A, #72, #61A, #77 High Speed Gear Shapers; latest type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #6Z2 Gear Shaper; high speed; latest type
FELLOWS #13LS Lapper, latest type
GLEASON 3", 12" straight bevel generator, Latest Type
GLEASON #7 hypoid, spiral, bevel, zerol, Latest Type
GLEASON #20 Spur Gear Tester, latest type
GLEASON #4, #6, #13, #18 Bevel and Hypoid Tester
GLEASON #17, Hypoid, Spiral, Bevel, Zerol Grinder, Latest
GLEASON 25" Straight Bevel Generator, M.D.
GOULD & EBERHARDT 36H Hobber, M.D.
GOULD & EBERHARDT 96 H Hobber with Diff., M.D.
GOULD & EBERHARDT 12HS hobber, Latest Type
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4 Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
BROWN & SHARPE #20 10x18 plain, latest type
CINCINNATI 6"x18" Plain, Model EA, Hyd., latest
LANDIS 10"x24" Type C, Universal, Hyd., Latest
LANDIS 4"x12" Plain, Type H, Hyd., Latest
NORTON 10"x36" Plain, Type C, Hyd., Latest
NORTON 16x72 Plain Type "C", latest type

GRINDERS—Miscellaneous

BARBER COLMAN #3 Hob Sharpener; latest type
BRYANT #5, #16-16, #16-CP-16, #24 Internal Hydraulic, latest type
CINCINNATI #2 Plain Cutter and Tool, Latest Type
CINCINNATI #2 Centerless; latest type
CINCINNATI Centerless Lapper, Model E.D., Latest
COVEL #22 Universal Tool & Cutter, Latest
HEALD 70A, 75A, 72A3, 72A5, 74, 81 Internal Plain and Sizematic Hyd., Latest Type
JONES & LAMSON 6x15, 8x48, Auto. Thread, latest

GRINDERS—Surface

ARTER 30" Rotary Model B Hyd., Latest
BLANCHARD #16, 24" chuck, M.D.
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #11, 16"; Latest Type
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A, Rotary, 30" chuck, Latest Type
MATTISON 14"x24"x72", Hyd., Latest Type
MATTISON 14"x16"x60" hydraulic, Latest Type
NORTON 6x18 Hydraulic; latest type
THOMPSON 16x30x18 hydraulic, latest type

JIG BORERS

VERNON Precision, M.D. Latest
PRATT & WHITNEY #1A M.D.
PRATT & WHITNEY #3B Model 4854, Latest Type

LATHES—Engine and Mfg.

AMERICAN 36"x60" centers, Geared, M.D.
AMERICAN 18"x72" centers, Geared, M.D.
BARNES #420, 2 spdl. deep hole drill, Latest Type
BAUSH 1½"x36" 2 spdl. deep hole drill and borer
BRIDGEPORD 36"x24' centers, 2 car., M.D.
HARDINGE TR-59, Latest Type
HENDEY 12x54" centers, Belted, M.D.
JONES & LAMSON "Fay" 20x25" automatic, latest
LeBLOND #2 deep hole borer, Latest Type
LeBLOND 17x5' bed, RP, Timken, Latest
LeBLOND 19"x30" centers, "REGAL", Latest Type
LEHMANN 16x30" centers, TIMKEN, latest type
LODGE & SHIPLEY 18x12 centers, M.D.
LoSWING 4x60, 4x84, 8x60, 8x198, 5x34, Latest
MONARCH 16x28" geared head, M.D
MONARCH 10"x20" centers, Model EE, Timken, latest
MONARCH 12"x30", 12"x54" centers, Timken, Latest
MONARCH 22"x456" centers, Model CM, 3 car., Timken Bearing, Latest Type
MOREY Model A 8"x120" shaft turner, Latest Type
NILES 90x110 centers Car Wheel, M.D.
NILES 42"x60" double head, M.D.
NILES 30x50' Boring, Timken, Latest Type
NILES 48x87' centers, 72x62' centers, comb. boring and turning, M.D.
NILES 60"x10' centers, Heavy Duty, PRT, Latest Type
PRATT & WHITNEY ½Bx30", ½Bx50", 2 spindle, Deep Hole Drill, Latest Type
PRATT & WHITNEY 10"x20" centers Bench, latest
REED PRENTICE 16x24" centers, geared head, M.D.
SEBASTIAN 16"x36" centers, Type H, Timken, Latest
SPRINGFIELD 14"x6' bed, geared head, M.D.
SPRINGFIELD 16"x6' bed, geared head, M.D.
WARD, HAGGAS & SMITH—18/30x66" centers gap

LATHES—Turret

BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4, #5 univ., Timken, Latest Type
JONES & LAMSON #3, #5, #8A Univ., Timken latest
LIBBY No. 1H-5 Timken Bearing—latest—5½" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON 5D2E, Auto., Timken, latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY #1A, Univ., Timken; latest
WARNER & SWASEY 2A, Univ., Timken, Latest

MILLING MACHINES—Mfg.

INGERSOLL 42"x38"x12' adj. rail, 4 heads, A.C., M.D.
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x30x12' adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex, latest type
TAYLOR & FENN M80 Duplex Spline, latest

MILLING MACHINES—Plain

BROWN & SHARPE #3B, TIMKEN, Latest
BROWN & SHARPE #12, 24" travel, Latest Type
CINCINNATI 0-8 Auto. Rise & Fall, Latest Type
CINCINNATI 1-12, 2-18 Timken Bearing, Latest
CINCINNATI #4 TIMKEN, Motor Drive
CINCINNATI 3, 4, 5, M.D.
CINCINNATI 4-36 hydromatic, Latest Type
KEARNEY & TRECKER 1218, TIMKEN, latest
KEARNEY & TRECKER #3, 4, Heavy Timken, M.D.
KEMPSMITH #4 Maximiller, Timken, latest type

MILLING MACHINES—Universal

CINCINNATI #3 Universal, Dial Type, Timken, latest
KEARNEY & TRECKER #3B, M.D.
KEARNEY & TRECKER 3H, Timken, latest
KEMPSMITH #4 Maxi-Miller, Timken, Latest
VAN NORMAN #12, TIMKEN, Latest Type

MILLING MACHINES—Vertical

CINCINNATI #2, #3, #4 Dial Type; Timken; latest
CINCINNATI 0-8 Timken Bearing, Latest
GORTON 9J, with or without duplicator, Latest
KEARNEY & TRECKER 2H, 2K, Timken, Latest
MOREY 12M, 2 spindle, Profiler, Latest
PRATT & WHITNEY 12B, 2 spindle, Profiler, Latest
REED PRENTICE 3VG with Hydraulic Duplicator Timken Bearing, Latest Type
SUNDSTRAND #3A, rotary, Latest Type

PLANERS

BETTS 96"x96"x20'—4 heads, PRT, Box Table, M.D.
CHANDLER 36x36x20', 4 heads, AC, M.D.
CINCINNATI 120"x96"x26'—4 heads, Box Table, M.D.
CLEVELAND 48"x60"x20' Openside; 3 heads; A.C. M.D.
DETRICK & HARVEY 48x48x16', 4 heads; Hyd.
GRAY 36"x36"x8'—2 heads, Max. service, D.C., M.D.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
NILES 54"x54"x18'—4 heads, Box Table, M.D.
NILES 72"x72"x25'—4 heads, Box Table, M.D.

PRESSES

BIRDSBORO 325 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton, vert. hydro-pneumatic
CHAMBERSBURG 200 ton horiz. straightening, M.D.
CLEARING Type H-50-36 35 ton Vert. Hyd., Latest
CLEARING Type DS-1125-32 dbl. action 125 ton, Latest Type
FERRACUTE #DG-55, 75 ton drawing, Latest Type
GLEASON 15" Quenching, M.D.
HPM 37 Ton Hyd. Vert., Latest Type
LAKE ERIE 500 ton, Vertical, Hyd., Latest Type

MISCELLANEOUS

AJAX 1⅛", 3½", Upsetter and Header, M.D.
BARNES #172, 306H, 307 Vertical Hone, latest type
BILLINGS & SPENCER 1500 lb. Board Drop Hammers
BROWN & SHARPE #4, 1½" cap. A.S.M., Latest
CAMPBELL #401 Abrasive Saw, Latest Type
CINCINNATI 1-30 3-30 Duplex, Vertical, Surface, Double Ram Broach, Model ER, Hyd., Latest
CLEVELAND 12"x16' centers—Cutter Reliever, M.D.
FOSTER 4"x18" Super Finisher, Latest
GOSS & deLEEUW 8"—3 spdl., Automatic Chucker, Latest Type
La POINTE SRV-10-54 Vert. Surf. Brach Hyd. Latest
MICHIGAN Model 1708, Hob & Cutter Reliever, Latest
NAZEL #4B Pneumatic Hammer, M.D.
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, latest type, 2 & 3 Dimensional
PRATT & WHITNEY (KELLER) Type G Copying; latest type 2 Dimensional
QUICKWORK #6—1" cap., Rotary Shear, M.D.

REED PRENTICE #5 Vertical Miller and Die Sinker Table 16x68

Available for Prompt Shipment ***Most Built After 1941***

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

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ADVERTISED PRICES ON PRACTICALLY NEW MACHINES

(6) CLEVELAND RIGIDTURNERS MODEL No. 616. Original Cost $7,000.00. Excellent Condition. PRICE.....$2,000.00 ea.

(1) POTTER & JOHNSTON #5D2 AUTOMATIC CHUCKING MACHINE. Two Spindle, Mfg. in 1942. Excellent Condition. Serial No. 52913. PRICE.....$4,850.00

(1) POTTER & JOHNSTON #6DRE AUTOMATIC CHUCKING MACHINE Single Spindle Mfg. in 1942. Excellent Condition. Serial No. 72519. PRICE.....$3,850.00

(1) NO. 8-D GORTON UNIVERSAL VERTICAL MILLING MACHINE, Serial No. 15634. PRICE.....$1,750.00

(1) 200 Ton HYDRAULIC STRAIGHTENING PRESS. Mfg. by Hydraulic Press Co., Length of Bed 240", Width 24", Clearance Between Rods 30". PRICE.....$4,500.00

(2) 2-25 TON BLISS DUPLEX PRESSES. PRICE.....$850.00 ea.

(1) NO. 33 EXCELLO THREAD GRINDER. Serial No. 4714, Mfg. in 1943. Excellent Condition. PRICE.....$3,000.00

(1) JONES & LAMSON MODEL NO. TG615 AUTOMATIC THREAD GRINDER. Serial No. 130156. Excellent Condition. PRICE.....$2,750.00

(1) NO. 75-A HEALD INTERNAL GRINDER. Serial No. 22065. Excellent Condition. PRICE.....$2,250.00

(2) NO. 72A-5 HEALD INTERNAL GRINDERS. Serial Nos. 13939 and 13940. Excellent Condition. PRICE.....$1,500.00 ea.

(2) NO. 74 HEALD INTERNAL GRINDERS. Serial Nos. 24602 and 24603. Excellent Condition. PRICE.....$2,250.00 ea.

(1) LANDIS 18 x 18 EXTERNAL GRINDER. Excellent Condition. PRICE.....$2,500.00

(4) PRATT & WHITNEY 9" GEAR GRINDERS. PRICE...$1,000.00 ea.

(4) DETROIT GEAR GRINDERS, Model GG-19. PRICE...$1,150.00 ea.

(1) TURCHAN FOLLOWER FOR BULARD BORING MILL. PRICE.....$1,000.00

(1) 24" STEPTOE SHAPER, With Universal Vise. New in 1942, Serial No. EB41385TB. PRICE.....$3,500.00

(2) WATSON-FLAGG THREAD ROLLING MACHINES. Mfg. in 1943. Serial No. 24896, Model No. 25-2500. PRICE.....$2,000.00 ea.

(1) GLEASON 15" QUENCHING PRESS. Excellent Condition. PRICE.....$1,250.00

(1) GISHOLT NO. 4-R SADDLE TYPE TURRET LATHE, Serial No. 2914-37, with 26" 4 Jaw Chuck, 9" Hole in Spindle, 4-Way Tool Post. Excellent Condition. PRICE.....$4,500.00

(2) PRACTICALLY NEW CENTURY LATHES, 16"x48", PURCHASED NEW IN 1946 AND 1947. PRICE....$2,500.00 ea.

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LATEST TYPE Pratt & Whitney 14" x 60" HYDRAULIC VERTICAL SURFACE GRINDER

Like New

OTHER FINE MACHINE TOOLS IN STOCK

4' American "Hole Wizard" Radial Drill, '42.
25" Smith & Mills Shaper, Rap. Trav., '42.
20" Smith & Mills Univ. Shaper, Power Down Feed, '42.
3—#2G B&S High Speed Automatics.
16"x54" c.c. Lodge & Shipley lathe.
#2H Kearney & Trecker Univ. Miller, '43.
3—#2G Kempsmith Univ. Millers, '43.
16"x33" Fay Auto. Lathe, '42.
42" N-B-P Car Wheel Lathe.
#2H Kearney & Trecker Vert. Mill, '42.
#4 Cincinnati Plain Mill, Rect. Arm.
4—#2M Cincinnati Plain Millers, Timken, mtr. in base.
3—#000 B&S Production Mills, '42.
12"x36" Norton "C" Univ. Cyl. Grinder, '41.
14"x40" B&S #3 Univ. Cyl. Grinder, '42.
6"x30" Norton "C" Plain Cyl. Grinder, '42.
#22 Heald, 12" rotary Grinder, '42.
7" Peerless Hydracut H.S. Power Hack Saw, 1942.
#91A Covel Univ. Tool & Cutter Grinder, 1942.

EVERYTHING FROM A PULLEY TO A POWERHOUSE

THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET -- PHILADELPHIA 6, PENNA.

BARGAINS!

SURPLUS EQUIPMENT

BRIDGEFORD 36x24' Centers Engine Lathe, Motor Drive

BULLARD 16" 6 and 8 spindle Mult-aumatic Type D Single Indexing, New 1943

CRANES from 5 to 30 ton capacity all 230 volts, DC current

FRANKLIN 4¼" Bar Horizontal Boring Mill Table Type Motor Drive

HEALD #48A Borematic Double Spindle Single End New 1941.

JONES & LAMSON "Fay" 20x25 Centers Production Lathe, New 1941

LoSWING 8x108" Centers Production Lathe, New 1941

NIAGARA 1000, 1200 KVA Transformers, New 1941

NILES 30x50' Bed Boring Lathe, New 1941

NILES 72x63' Centers, Combination Boring and Turning Lathe, Motor Drive

WORTHINGTON 3½"x18" Horizontal Duplex Pump Type HDDA; 270 G.P.M., New 1944

This is a partial listing. More than 1,000 other items for immediate delivery. Our prices cannot be duplicated. We Solicit your inquiries.

HARRISON MACHINERY EXCHANGE, INC.

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Indianapolis QUALITY MACHINE TOOLS

PARTIAL LIST OF MACHINES NOW IN STOCK

AUTOMATICS

2G Brown & Sharpe, H.S. 1½" capacity. New, 1943.
9/16" RA-6 Acme-Gridley. New, 1943.
1⅝" 6 Spindle Greenlee. New in 1942.
3½" RA-6 Acme-Gridley. New, 1942
6" 4 Spindle Conomatic. New, 1942.
★**Bullard Multaumatic, six spindle model D, single indirect. Late Model.**

BORING MILLS

★**Universal No. 40 Tri-Way, 4" bar, with facing head rotary table, boring bar, motor and control. New in 1943.**
Heald No. 49 "Bore-Matic," three spindles each end. New in 1942.
Excello Model 1212A, Double end. New in 1942.

BROACHES

No. CPC 6-30 LaPointe Hydraulic Vertical. New, 1941.

DRILLS

3' and 4' Dreses Radial, 11" column, enclosed head, 1938 model.
No. H3 Barnes Hydram, 8 speed. New, 1942.
KH 2 Allen, 6 spindle. New, 1943.
No. 3 Baush Multiple Spindle.
Barnes Horizontal Deep Hole, two spindle.
42" Cincinnati-Bickford, single spindle.
25" Fosdick Upright Drill. Late Model.

GEAR CUTTERS

★**No. 12B Gleason Straight Bevel Gear Rougher, complete with gears, tools, setting gauge, motor and control. Like new.**
No. 7A Fellows Gear Shaper.
No. 615A and 645A3 Fellows Gear Shaper.
No. 12 Barber Colman Hobber.

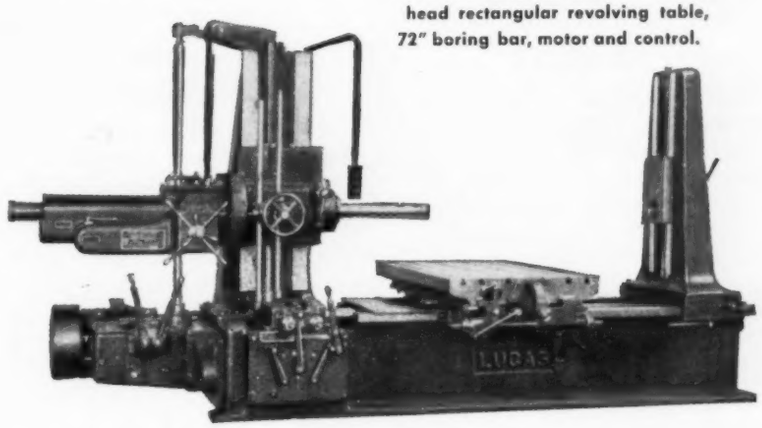
GRINDERS

No. TG615 Jones & Lamson Thread Grinder. New, 1943.
No. 2 and No. 3 Cincinnati Centerless, Filmatic. New in 1942.
★**No. 2 Cincinnati Universal Tool & Cutter Grinder, complete. New in 1942.**
No. 22 Covel Universal Tool & Cutter Grinder. New in 1943.
No. 3 Brown & Sharpe Universal. New, 1943.
4" x 18" Landis, Type H.
6" x 18" Cincinnati, Filmatic Bearing.
10" x 36" Landis Hydraulic. New, 1943.
★**10" x 48" Cincinnati Plain Hydraulic Grinder reciprocating spindle, hydraulic in-feed. New in 1943.**
No. 22 Heald Rotary Surface Grinder. New, 1943.
No. 18 Blanchard, 30" chuck. New, 1942.
16" x 16" x 48" Thompson Model C, Surface.
3B Abrasive, with chuck. New, 1943.
No. 5 Brown & Sharpe Surface. New, 1942.
6" x 12" x 18" Thompson Surface Grinder. New, 1942.
No. 2B Reid Surface, for wet grinding.
No. 16CP16 Bryant Hydraulic Internal Grinder, New, 1942.
No. 75A Heald Internal. New, 1943.
No. 72A3 & 72A5 Heald Internal. New in 1943.
No. 74 Heald Extended Bridge Type Internal Grinder.

LATHES, ENGINE

Hendey 12" x 30", g.h.
Reed Prentice, 14" x 30" g.h.

No. 42 Lucas Horizontal Boring, Milling and Drilling Machine, 4" diameter spindle, 40" x 60" table maximum distance face plate to outboard support 96"; 18 speeds (9 to 255 RPM); with star facing head rectangular revolving table, 72" boring bar, motor and control.



Lodge & Shipley Tool Room, 14" x 54", rel. att. New, 1943.
Reed Prentice 14" x 78" Toolroom. New, 1943.
American Pacemaker, 16" x 30". New, 1942.
Reed Prentice 16" x 54". New, 1943.
Sidney 18" x 54". New, 1943.
Lodge & Shipley 20" x 48". New, 1943.
★**Bertram 28" x 240" "Timesaver", two carriages, with rapid traverse. Canadian made from Niles patterns. New, 1942.**
Lodge & Shipley 48" x 54", C.D.
Carroll Jamieson 18" x 5', C.D.
South Bend 14½" x 6'. New, 1944.
Lo-Swing, models IMP and R.

LATHES, TURRET

Warner & Swasey No. 4A, with chuck, 7½" hole.
★**Warner & Swasey No. 2A, preselector, Cross sliding turret. New, 1943.**
Warner & Swasey No. 1A, preselector, cross sliding turret. New in 1942.
Jones & Lamson No. 9A. New, 1943.
Gisholt No. 3L. Late Model.
Gisholt No. 2L, cross sliding turret. New, 1943.
Acme No. 1 Universal, saddle type. New in 1941.
Bardons & Oliver No. 7 Ram Type, Bar feed and tooling. New in 1942.
Foster No. 5 Universal, Bar feed. New, 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal. New, 1942.
Bardons & Oliver No. 3 Universal, motor in base. New, 1941.
Warner & Swasey No. 2, oversize. New, 1942.
Bardons & Oliver No. 2, bar feed. New, 1941.
★**Bullard 36" Universal High Speed Spiral Drive VTL. New in 1942.**

MILLS

Milwaukee No. 2H Universal. New in 1942.
Cincinnati No. 2M Universal.
Brown & Sharpe No. 2A Universal. Late Type.
Brown & Sharpe No. 1 Universal with vertical milling attachment. Latest model.
Kempsmith Maximiller Plain, No. 3.
Brown & Sharpe No. 3B Plain. New, 1943.
Brown & Sharpe No. 2B Plain.
★**Cincinnati Vertical Hydrotel, 28" x 60", equipped with 360° profile attachment, and depth attachment. New in 1941.**
Milwaukee No. 3H Vertical. Latest model.
Cincinnati No. 2 Vertical. New, 1940.
Bridgeport Vertical Mill.
Cincinnati Plain No. 08 and 2-18. Rise and Fall.
Cincinnati No. 1-12 Automatic.
Cincinnati No. 3-36 Hydromatic.
Cincinnati No. 34-36 Hydromatic High column with Hydrotel.
Milwaukee No. 1248 Simplex.
DeVlieg Supermill No. 31B.
Brown & Sharpe No. 12. New, 1942.
Whitney Hand Mill. No. 6.
VanNorman Hand Miller. New in 1942.

MISCELLANEOUS

★**Fosdick Jig Borer, No. 30, with 16" power rotary table, rods and indicators.**
Jones & Lamson Comparator.
Cleveland Rigidturner, No. 616.
14" x 20" Racine Hydraulic Saw.
12" x 12" Peerless High Speed Saw.
Marvel Hack Saw 6" x 6".
No. 4B Do All 16" Band Saw.
No. 26F Norton Hydrolap.
No. 8-6 Zeh & Hahneman S. S. Geared Press.
Toledo No. 41 Horn Press.
Tapper, Leland Gifford 3' Radial, No. 3 M.T. New, 1941.

PLANERS AND SHAPERS

Cincinnati Planer, 42" x 42" x 20', Four heads D.C.
Cincinnati Planer 52" x 36" x 40' four heads, box table. D.C. motor drive.
6" Ammco Bench Shaper.
Smith & Mills 28" Shaper.
Cochrane & Bly No. 14 Vertical Shaper. New, 1942.
Pratt & Whitney 6" vertical shaper. New, 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
High Quality NEW, USED & REBUILT Machine Tools
1961 S. Meridian St., Indianapolis 6, Indiana
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MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

LATE TYPE MACHINE TOOLS

New — 1941-1945

Motor Driven — Excellent Condition

BORING MILLS

#22 Defiance, 2½", Table Type
#25B Defiance, 3¾", Table Type
#40-4" Landis Floor Type
5" Ohio Floor Type
#48A Heald Single End Boremastic
#49 Heald Univ. Single End Boremastic
#49 Heald Single End Boremastic
36" & 42" Bullard Spiral Drive Vertical Turret Lathes

DRILLS

#D5 Natco Multiple
5' American Radial

GEAR MACHINERY

12" Gleason Straight Bevel Gear Generator
#13 Gleason Univ. Gear Tester
15" Gleason Quenching Press
15" Gleason Spiral Bevel Cutter Sharpener

GRINDERS

#72A3 Heald Sizematic Internal
#72A3 Heald Plain Internal
16" x 16" x 48" Thompson Type C Hydraulic Surface
12" x 5" J. & L. Model TG125 Internal Thread
14" x 48" Cincinnati, Plain
#13 Brown & Sharpe Universal & Tool
#1 & #2 Brown & Sharpe Universal

NUT & BOLT MACHINERY

#250C Manville SSSD Header
#2 Waterbury Farrel Automatic Nut Tapper
#33 Waterbury Farrel DSOD Header
5/16" National SSSD Ball Header
#500C Manville Thread Roller

PLANER

42" x 42" x 18' Gray
54" x 42" x 18' Gray
48"x48"x26' Niles Bement Pond

PLAIN MILLING MACHINES

#000 Brown & Sharpe Automatic
#2-18 Cincinnati Automatic
#2-24 Cincinnati Automatic
#1H-18" Kearney & Trecker Mfg.
#1854 Kearney & Trecker Simplex
#3-24 Cincinnati Plain Hydromatic
#4-36 Cincinnati Plain Hydromatic
#2SP Van Norman
#3SP Van Norman
#26 Van Norman, Ram Type
#5H Kearney & Trecker
#5HM Kearney & Trecker

UNIVERSAL MILLER

#3SU Van Norman

VERTICAL MILLERS

#2 Cincinnati Dial Type, Medium Speed
#2K Kearney & Trecker
#4K Kearney & Trecker
#2 Standard Brown & Sharpe

TURRET LATHES

#1A Warner & Swasey Geared Head
#2 Warner & Swasey Electric Head
#4 & #5 Warner & Swasey Geared Head
#3 Gisholt Geared Head
#5U Foster, Geared Head
#7A Jones & Lamson Geared Head
#1L Gisholt Geared Head

WIRE — PHONE — WRITE

J. L. LUCAS & SON, INC.

BRIDGEPORT 5, CONN. **PHONE 9-3393**

AUTOMATICS

⅞" & 1¼" Cone 4 spindle
1⅞" Conomatic 8 Spindle
1⅛" Cleveland 4 Spindle
2"x18" Cleveland, model B
No. 454 New Britain Chucking
14"x19" & 16"x33" Fay
16"—6 station Bullard type D Mult-Au-Matic
8"—6 station Bullard Mult-Au-Matic
No. 2 FU Foster Fastermatic
No. 3D Gisholt Simplimatic
1" type S Economy automatic shaver

GRINDERS, CYLINDRICAL

4"x12", No. 4H Landis hydraulic
6"x18" Norton semi-automatic hydr.
6"x18" Norton type C hydraulic
6"x18" Landis type C hydraulic
6"x18", No. 10 Brown & Sharpe elec. hydr.
Nos. 10 & 11 Brown & Sharpe mechanical
Nos. 1 & 2 Brown & Sharpe universal
No. 13 Brown & Sharpe universal
10"x18" & 10"x50" Norton mechanical
10"x18" Landis Type C hydraulic
10"x24" & 16"x72" Landis mechanical
10"x36", No. 2½" Bath universal
14"x36" Landis type C hydraulic
16"x36" Landis type D semi-auto. hydr.

GRINDERS, SURFACE

16" No. 10 Blanchard rotary
30", No. 16 Blanchard rotary
12" & 16", No. 22 Heald rotary
16" & 24" No. 25A Heald rotary
8" Pratt & Whitney rotary
12" Walker model DA rotary
8"x22" Abrasive No. 3
8"x24" Abrasive No. 34 vertical
10"x24" Norton hydraulic
12"x48" Thompson hydraulic
14"x60" Mattison hydraulic
14"x36" Pratt & Whitney vertical

LATHES, TURRET

Nos. 4, 1L & 3AL Gisholt universal
Nos. 3 & 5 Jones & Lamson univ.
Nos. 3, 5, 1A & 3A Warner & Swasey univ.
No. 2F Foster Fastermatic
No. 5 Foster universal
Nos. 2G & 3 Morey universal
Nos. 4 & 4B Midland universal
Nos. 5 & 7 Bardons & Oliver universal
1½" No. 601 DD Oster
3"x36" & 4"x34" J.&L. flat turret
No. 5 Foster, old style
28" Gisholt, old style
Nos. 2, 4, 4 Univ. & 6 W&S old style
24" & 42" Bullard New Era vertical

MILLS, BORING

3" No. 3A Universal horizontal
4", No. 42 Lucas horizontal
7" Barrett cylinder boring
53" & 100" NBP vertical

MILLERS, KNEE TYPE

Nos. 2AS, 3B & 4B Milwaukee
No. 3 Cincinnati High Speed Dial
No. 3 Van Norman duplex
No. 3 Cincinnati universal
Nos. 2M, 2, 3, 4 HP Cincinnati vertical
No. 3V Van Norman vertical
Nos. 2H, 3H & 4H Kearney & Trecker vert.
Fray All Angle vertical
Vernon vert. mill & jig borer
No. 2A Pratt & Whitney jig borer

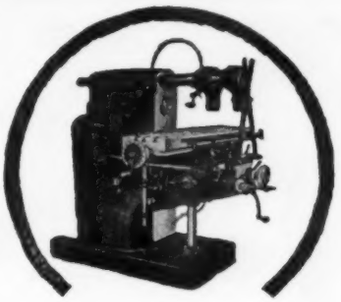
PRESSES

42", No. 90E Toledo double crank
54", No. 3D Bliss double crank
66', No. 6D Bliss double crank
84", No. 95E Toledo double crank
108", No. 96½E Toledo double crank
P1, P2, P3, P4 & P5 Ferracute
PAG 4 Ferracute adjustable bed
No. 11 Toledo adjustable bed
12 ton Leffler adjustable bed
No. 15H Rousselle adjustable bed
Nos. 73½, 75½, 304 & 307 Bliss S.S.
No. 56 Toledo straight side
Nos. 1½ & 1½C Bliss cam draw
No. 10 Bliss reducing
500 ton No. 2 National Maxipress
600 ton No. 2316½ Hamilton Forging
1000 ton French Oil hydraulic
100 ton HPM hydraulic
75 ton Southwark hydraulic

MILES MACHINERY CO.

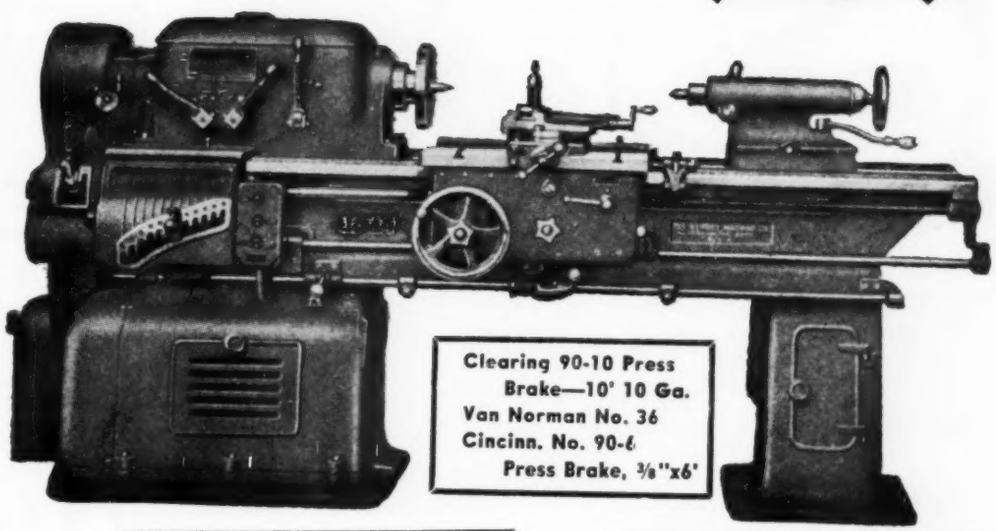
SAGINAW, MICH.

AARON VALUES IN MODERN TOOLS



SCARCE LATE MACHINES

Conomatics 6 spdl. 2⅝", 1½" late, fully equipped.
NBP 2500 lb. Single Frame Steam Hammer
Ferracute D.D.G. 56, 105 ton Double Action Cam Press.
Universal 3" boring mill
Gorton Duplicators and Vert. Millers, 8D, 9J
Gorton No. 3Z, Engravers
Marvel 6A Hacksaw, M.D., Auto. Feed
Injection Moulders, Hydraulic Presses
Thompson 6 x 18" Hyd. Surf. Grinder
Abrasive 6x18, 8x24 Surface Grinders No. 3B, 34, 1½
Conomatic 1⅞" 8 spindle
Brown & Sharpe #5 Cyl. Grinder
Tannewitz Band Saw #36M
Thompson Seam Welder
Mod. 28 Rafter, New 1945
W & S Nos. 3, 4 Grd. Hd., Pre-selector
Gisholt No. 5, Univ. Turrets
Acme #2 M.D., Foster 3B
Oliver 20" Woodworking Planer
Oster 601 Rapiduction, Tooling
Hardinge ESM, 2nd operation
Cincinnati 12x36" Univ. Grinder
No. 18, 25 and 35 Gallmeyer and Livingston Hyd. Surface Grinders, 6x18, 8x24
#25A Heald, M.D., like new Rotary Surf.
Cinn. #2 Centerless Grinders Filmatic
B & S No. 2, 2B Surface, M.D.
Norton 6x18" Hyd. Surfaces, M.D.
Covel #91A Tool, & Cutter Hammond & Excello Carbide Grind
Gardner #226 Disc
Monarch EE 10"x20" Lathe
Hendey 12x30, G. H. Lathes
Morey No. 3 Univ. Turret Lathe
South Bend, M.D. 9x3½", 10x48", 13"x5'
Sebastian 12"x4' grd. hd.
Rivett No. 918 bench M.D.
Hardinge Cabinet Lathe
Lodge & Shipley 16"x78" 12 speed Grd. Hd. lathe
Buffalo #0 Angle Roll, M.D.
Bliss #58.0B Gap Presses 62, 62A, 162
Burke Miller Pl. & Univ.
Nichols Hand Miller, Vert. Hd.
Delta Single & Multiple Drills
Oliver Heavy die Filer, 516 Drill Pointer, Sellers 4G
Taylor Winfield 50 KVA Spot Welder
Peerless No. 226, Eyeletting
Hi Speed Hammers, all sizes
Cinn. #3 Pl., #4 Vert. Dial Type, Rect. Arm, Mills
B. & S. #12 Elec. Prod. #21,000
Waterbury-Farrell #30 Thread Roller & Dies, 1943
Cinn. Bickford 24" Super Serv.
V & O 102 Reducing Press
V & O, Z & H 25, 35, 75 Ton OBI
Cinn. 1-12, 2-18 Production Mills
Pratt & Whitney 1 & 2 spindle Profilers, Morey Type R, T
Stokes Tablet Presses
Ball & Jewel Plastic Grinders
20"x30' Boye & Emmes Grd. Hd., Lathe
Onsrud Router W240
Micromatic Hydrohoner H1
Walker-Turner Bench Drills, ½ H.P.
Porter-Cable G8 Belt Sander
Le Blond 19"x120" cc. Lathe
Wilder Optical Comparator
Black Diamond Drill Grinder
Cinn. & Schauer Speed Lathes
Cleveland #1 Vertical Miller
Chicago (Dreis & Krump) #334 Press Brake
Rockwell, Clark Hardness Testers
Bakewell #1, Ultromat Tappers



Clearing 90-10 Press Brake—10' 10 Ga.
Van Norman No. 36
Cincinn. No. 90-6
Press Brake, ⅜"x6'

NEW IN STOCK

Power Foot & Gap Shears—30" to 96"
Spot & Arc Welders, 6x6" Racine Hacksaw
5, 7, 14, 18 & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
20 ton Northern Hydraulic Presses
10Z & 20Z Injection Moulders
Famco 6C Arbor Presses—½ Price

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B, M.D. Univ.
J. & L. 2"x24", 3"x36"

GRINDERS

Surface Grinders, 6x18, 8x24, Abrasive, G. & L.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.: 1, 3 Univ.

LATHES

26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
Wade, Hjorth, Hardinge, P & W Precision Bench

AUTOMATICS

Cleveland Model A ⅞", 1¼", 2"; B 1", 2", ⅞"
Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto., #2 Hand Screw

MISCELLANEOUS

Pexto 3' to 8' Shears & Brakes
Gorton 1A: 375-2 Tool & Cutter Grinders
Wiedman Turret Punch—Type R4P
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Deckel G1, G2, GIF Engraving machine
Hanson Whitney Thread Miller, Planetary
Leland-Gifford 1, 2 & 4 spindles, Model MS
Geo Ohl 8' 16 Gage M.D. Shear

HYDRAULIC EQUIPMENT

2000 TON BIRDSBORO PRESS

Self Contained

60" between rods left to right, 53" front to rear. Overall length of platen left to right 144". Stroke 30". Opening 36". 60 H.P., 3 phase 60 cycle, 220-440 V motor.

500 TON LAKE ERIE PRESS

Platen 35"x36", 36" stroke, 68" opening, 150 H.P., 220-440 V. Motor.

350 TON VERSON PRESS

40x40 platen, 36" stroke, 50" opening. 100 H.P. 3 phase—60 cycle 440 volt.

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

MILLING MACHINES

3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.: #1 Univ.
#2B K. & T. Univ.; No. 2, 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 1½, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, Morey Profilers
B. & S. No. 1, 3 Vert.
Taylor-Fenn Spline Miller

RADIALS

Carlton 8' Arm 19" col. M.D.
4', 5', 6' American Triple Purpose
Walker-Turner ½" cap.

BORING MILLS

#0 Giddings & Lewis arr. M.D. 3"
2½" Cleveland arr. M.D., 2½", 4" Binsee
Niles-Bement-Pond 4- duplex, 66" Niles
Bullard New Era 24", 42", King 42"

AAron Machinery Co., Inc.

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REBUILT BY EXPERTS ONLY BOTWINIK MACHINE TOOLS Keep Production Up Costs Down

LATHES

1—Hendey 14"x6' Mod. EBM Eng. Lathe, sw. 14½", dist. betw. cens. 35", 18 spin. speeds, motor driven.
1—Porter-McLeod 24"x12' Q.C.G., S.B.G., Cone Driven Eng. Lathe, sw. over ways 25"; dist. betw. cens. 85" hole thru spindle 1¾" taper attmt.

BORING MILLS

2—Bullard 36" "Spiral Drive" Vert. Bor. Mill, face of turret to tbl. 34", clear under cross rail 27¼", vert. trav. of turret 26⅜", clear under S.H. slide 16", 3 and 4 jaw chuck, approx. wght. 17,500 lbs.

MILLERS

1—Cin. No. 2 High Power Univ. Miller rect. overarm tbl. wkg. surf. 52"x12" long, feed 32" cross 11" vert. 20" spindle speeds 16 range 15-375 RPM, M.D.
1—Milwaukee No. 4H Vert. Miller, tbl. wkg. surf. 74"x15½", feeds: long. 42", cross 14", vert. 16", motor driven, very latest type.
1—Cin. No. 5 Plain Hor. Mill. Machine, rect. overarm High Power Miller, tbl. wkg. surf. 79"x21" power long. feed 50", cross 14", vert. 21".

GRINDERS

1—Hill-Acme Hydraulic Surf. Grinder, capac. 18"x24"x96", horiz. spin., with mag. chucks, latest type.
1—B. & S. 1, 2, 3, and 4 Univ. Cyl. Grinders, capac. 10"x20" (No. 1), 14"x30" (No. 2), 14"x40" (No. 3), 14"x60" (No. 4) very latest type.
1—Abrasive No. 5 Auto. Hor. Surf. Grinder complete with electro magnetic chuck 14"x60" range: long. 64" cross 15½" vert. 15½".
1—Cin. No. 3 ball bearing Centerless Grinder, capac. ¼" to 6" diam.; equip with extra wide wheel guards; power truing attmt. for grinding wheel, M.D.; excellent condition.

PRESSES

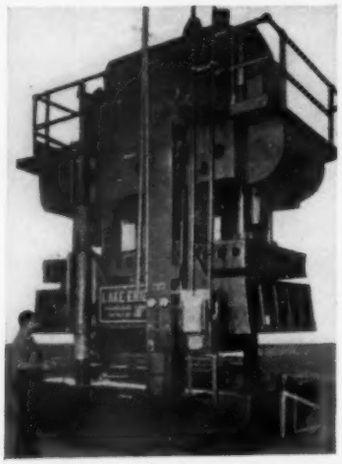
1—Farquhar 100 Ton Hyd. Press, daylight 48", stroke 36", approach and return speed 1600' per min., given maximum variation 5 degrees, wght. 44,000 lbs., elec. equip. 440/3/60, condition equal to new.

MISCELLANEOUS

1—Bliss 10" 2-high cold rolling Mill; direct motor drive 100 HP, forced feed mech. lubricator 4 pair rolls 1 reel 16" diam. 16" face direct drive with 7½ H.P., Lincoln induction motor and control, edge rolling attchmt.

Botwinik Brothers
OF MASS., INC.
5 SHERMAN ST. WORCESTER 1, MASS.

IMMEDIATE DELIVERY



750 Ton Lake Erie Double Action Hydraulic
Max. Pressure: 750 tons
Max. Daylight: 49" Min. Shut Height: 3"
Max. Stroke: 46"—main & pull back cylinders..
Max. Stroke: 46"—clamping cylinders
Max. Draw: 22¾" Platen: 146"x81½"
Distance Between Columns: front to back 72", right to left 55"

CAPITOL MACH. CORP.
253 Centre St., New York 13, N. Y.

PRESSES
IMMEDIATE DELIVERY

60 ton. Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel (15).
200 ton 12" stroke, 27x27 bed, Bliss 43'.
#56 Toledo 4" stroke, 21x21 bed, 15½" shut height.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke, 21x27 bed, 110 strokes per min., Bliss, latest type.
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late Type
Inclinable, Walsh, new, 20 to 70 ton, immed. delivery from stock.

AUTOMATICS, LATEST TYPE

2⅝" RA6 Acme Gridleys
#0G B & S, late type
1" New Brit. Grid., 6 spdl.
1⅜" R4—New Brit. Grid.
1½ Cone—8 spdl. ('39)
9/16 RA6 Acme Grid.
2¼ Cone, 6 Spdl. $6000.00
16" 8 spdl. Bullard Multaumatics, pract. new, $9000.00 ea. (5), with some tooling, dbl. & sgl. index.
12" 8 spdl. Bullards, late type, lots of tooling.

HORIZ. BORING MILLS

3" Bar De Vlieg 6' bed, late type
3" Bar Univ. 6' bed, late type

PAUL'S MACHINERY COMPANY
MONA MEMBER
6111 Vermont Avenue
Detroit 8, Michigan
TYLER 7-6300

BENNETT SPECIALS

72" Cinci. Vert. Mill, P.R.T., M.D.
36" Bullard Spiral Dr., 3 & 4 jaw, '42
6" bar Ingersoll Floor Type Mill 6' vert. & 6' hor., new 1943
5" bar Sellers Table Type Mill, 48" spin. to table, 120" spin. to outer support, '42
4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42
3½" bar Cinci. Gilbert Table Type Mill, 84" spin. to outer support, 42" spin. to table, 1943.
3½" & 4" Landis Floor Type Mills
48" & 19'6" centers Niles Heavy Lathe, Taper, new 1943
36"x32' bed Niles Lathe, 2 carr., T.A.
20"x92" centers Hendey Lathe, T.A., collets
7' Carlton 17" col. Radial, 1943
Nos. 2 & 3 W. & S. Univ. Turret Lathes (3), '42
#4 Gisholt Univ. Turret Lathe, 1942
No. 3K K. & T. Vert. Miller, 1942
48"x48"x24' Gray Planer, 4 Hds., Non-Metallic ways, '42. Var. Voltage
36"x36"x12' Cinci. Hypro Planer, 4 Hds., Var. Voltage, 1943
16"/19½"x54" cc Springfield Lathe, 1944

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

HASCO'S
MACHINE TOOL BARGAINS
IMMEDIATE DELIVERY

GIDDINGS & LEWIS #32 3" Bar Horizontal Boring Mill
KING 52" Vertical Boring Mill
GRAY 30"x30"x14' D.H. Planer
PUTNAM 42"x50' Gd. Hd. Lathe, AC Drive, Two Carriages
PUTNAM 42"x18' Gd. Hd. Lathe
CINCINNATI #4 Plain Miller, Rectangular overarm
BROWN & SHARPE #2G Automatic
Large Selection of Turret Lathes, Bar and Chucking

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Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

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GRAY PLANERS, (2) 74"x48"x20', 4 heads, DC Motors
SLAB MILL, 24" ROLLER TYPE, 75 HP MOTOR DRIVE, "IXL" Gear Box
EX-CELLO, Model 33, External Precision Thread Grinders, 6"x18"
LEES BRADNER MODEL CT, THREAD MILLERS, 36" centers, 13" spindle
BRIGEFORD, 14" Axle Turning Lathe
LE BLOND #3 Plain Milling Machine
BROWN & SHARPE, #13-B Manufacturing Mill
FARNHAM, 12' Forming Roll
125 KVA SWIFT SPOT WELDER 24" THROAT

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1836 EUCLID AVENUE, CLEVELAND 15, OHIO
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#3L GISHOLT, SADDLE TYPE, HIGH PRODUCTION TURRET LATHE, MFG'D NEW 1942

5-1/16" spindle bore—Preselector Head with 12-speed Headstock with optional speeds up to 333 RPM including 15 HP Westinghouse 220/440-60-3 Motor—Equipped with bar and quantity chucking equipment.

Current replacement price over $17,000.00

OUR PRICE with unconditional 30 day guarantee—F.O.B. Chicago, Illinois

$9,750.00

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For more than 80 years

THE NAME "HILL-CLARKE MACHINERY" HAS MEANT THE BEST BUYS IN MACHINE TOOLS . . . . . .

AUTOMATICS
No. 2 Brown and Sharpe
1⅝" Greenlee, 6 Spdls (1941)
No. 61 New Britain 6 spindle 2¼"
No. 6 Brown & Sharpe

DRILLS
No. D-8 Colburn No. 6 Morse Taper
No. 2LMS—26"—2 Spdl. L.G. (1945)
No. 2LMS—26"—4 Spdl. L.G. (1942)
No. 2LMS—14"—4 Spdl. L.G.
No. 2MA6—15"—4 Spdl. Avey
No. 1LMS—20"—6 Spdl L.G.
No. 3B—24"—6 Spdl. Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
No. 4 BL Natco 36 Spdls.
7'-15" Col. American Full Universtal

GEAR MACHINES
No. 61-A Fellows Gear Shapers (1942)
No. 615-A Fellows Gear Shaper (1942)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 18-H Gould & Eberhardt
No. 36-H Gould & Eberhardt
11" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter
No. 13 Gleason Univ. Tester

HOR. BOR. MILLS
No. 26 Defiance, 4½" bar
No. 31 Lucas, 3" bar
No. 3A Universal, 3" bar
Rockford, 3⅛" bar
No. 48-A Heald Boremattic

GRINDERS
4"x12" Landis, Model H (1942)
4"x18" Landis Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"

12'x36" Landis Type LCH Universal (1945)

No. 5—8"x24" Covel Hydr. Surg (1941)
24"x24"x84" Mattison Hydr. Surf
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)

72A-3 Heald Internal Grinder
72A-5 Heald Internal Grinder
No. 5 Bryant Internal Grinder
No. 16-38 Bryant Internal Grinder
No. 24-26 Bryant Internal Grinder

10"x72" Colonial Broach Grinder

LATHES
13"x30" Pratt & Whitney
14"x6' Hendey
15"x5' Sebastian
16"x54" centers LeBlond
16"x78" centers American Pacemaker
22"x48" centers Monarch
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
48"x20' Simmons
50"x17' centers LeBlond (1942)

LATHES (Production)
8"x15" Sundstrand, Model B (1942)
8"x15" Sundstrand, Model D (1943)
8"x15" Sundstrand, Model E (1942)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo
16"x21" Fay Automatic
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES
No. 4 Cincinnati Plain (1943)
No. 08 Cincinnati Vert. (1942)
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
No. 1 U.S. Hand Millers
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand Electromil (1942)
No. M-18 Milwaukee Simplex (1942)
No. M-24 Milwaukee Simplex (1942)
Fitchburg Duplex Miller (1943)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hydromatic (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x132" Pratt & Whitney Thread Miller
10"x48" Hanson-Whitney Thread Miller (1942)
12"x24" Lees-Bradner, Model HT (1943)
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
72"x48"x12' Ingersoll Adjustable Rail

MISCELLANEOUS
48"x36"x14' Gray Planer
Model H-7 Micromatic Hydro Honer
Model H-705 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
No. 22-C Racine Shear Cut Hack Saw
No. 20 Bliss O.B.I. press
No. 2 V & O open back press
No. 0 Bakewell Tapper
Baush Tapper

TURRET LATHES
No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Bardons & Oliver (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERT. BOR. MILLS
34" King
52" King
72" Cincinnati
72" Niles Extra Heavy
84" Betts

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HILL-CLARKE MACHINERY CO.
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Chicago 6, Ill.

FOR SALE

700 TONS 3-11/16" ROUNDS

Lengths 10′ 10″ to 12′ 6″ having the following analysis:

C-.64 to .67—Phos. .012 to .019 Silicon .28 to .29. Chrome .43 to .44—Manganese 1.26 to 1.31 Sulphur .021 to .025—Nickel .52 to .53 Moly. .11 to .12.

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STOCK TOOLS — *Prompt Shipment*

BORING MILL, Hor. #0 G & L, 3" bar
BORING MILLS, Ver. 24" & 42" Bullard
BORING MILL, Vert. 14' Niles, 2 hds., m.d.
BROACH, XA Oilgear, Hor., 60" str.
DRILL, Hyd. No. 15 HC Fox, 24 spdl., #2 m.t.
GEAR HOBBER, 36-H Gould & Eberhardt, m.d.
GEAR SHAPER #75 Fellows, 6½" helical
GRINDER, Int. No. 72-A-5 Heald Hydraulic
GRINDERS, Surf. Nos. 3 & 5 Abrasive
GRINDER, Surf. Rotary No. 25 Heald
HAMMER, Pneumatic, No. 6-B Nazel
LATHE, 14"x6' L & S, 12-Speed Grd. Hd.
LATHES (3) 18"x10' L & S 12 Speed Grd. Hd.
MILLER, Slab, Newton with vert., spdl., tbl. 20"x17"
MILLER, Pl. No. 3, 4 & 5 Cincinnati
MILLER, Thread, No. 40 Lees-Bradner
MILLER, Duplex, 24" Cincinnati
MILLER, Univ. No. 4 Cincinnati
PIPE MACHINE, 8" Landis, m.d.
PLANER, Openside, 72"x72"x24' D & H
PLANER, Openside, 108"x96"x24' D & H
PLANER 72"x72"x12' N-B-P, 4 hds., m.d.
PRESS, Wheel, 400 ton Niles, 88"x18'.
SHAPERS, 24" and 32", m.d.
SHEARS, 10'x10 ga., 12'x18 ga., 11'x1½"
SHEAR, Allig. No. 1½ D & K, 2" rd.

LANG MACHINERY COMPANY

28th St. & A.V.R.R., Pittsburgh, Pa.

McDONALD
USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive No. 34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp, Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20"x8' Grd. Hd., M.D. & 28"x12' Lathes Monarch Model "C"
American 24'x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

McDONALD MACHINERY CO.

1531-35 No. B'way., St. Louis 6, Mo.

MACHINERY

LATHES

25"x16' LeBlond Gear Head T.A.
12"x30" Pratt & Whitney Tool Room Lathe
12"x18" Monarch Production Lathe
Lodge & Shipley Duematic 3A
#4 Warner & Swasey Bar Feed
#3 Bardons & Oliver Hand Screw Machine
#2 Simmons Hand Screw Machine
#3 Gisholt Air Chuck
16"x54" Hendey G.H. Tool Room, 1943
14"x6' Lodge & Shipley Tool Room, 1943
U. S. Mod. 95 Pol. Lathe
4A, Warner & Swasey Bar Feed

MILLS

No. 4 Cincinnati Horizontal
No. 4 Horiz. Kempsmith Maximiller
2-24 Cinn. Rise and Fall, 1944
3 Kearney & Trecker Universal, 1944

GRINDERS

Norton 12x48 Univ.
14"x72" Norton Pl. Cyl.
14"x72" Cinn. Pl. Cyl.
No. 2 Cinc. Centerless Filmatic Brg. with Bar Feed

PRESSES

200 Ton Consolidated #67A
250 Ton Baldwin Southwark Hyd. Platen 12'x4'
Cleveland 10S Str. Side, Air Cushion, M.D.
40 Ton O.B.I. Dble Crank, 40"x17" Bed
25, 50, 60 and 150 Henry Wright Dicing Machines
28"-60" Cincinnati Hydrotel
35"-60" Cincinnati Hydromatic

SHEARS

Bertsch 12'x⅛" cap.
Niagara ⅜"x62"—18" Cap. M.D.

SCREW MACHINES

New Britain Model 412 Chuckers
New Britain Model 656 Chuckers

SHAPERS

16" American Universal
#5 Mitts & Merrill Keyseater
Cinn. 24" Heavy Duty Universal

MISCELLANEOUS

Hammond Automatic Buffer, Model SB-6
4-N Nazel Lobdel Forging Hammer
Model 101 Production Tube Polisher
Climax Wire Straightener No. 2
DeLaval Oil Centrifuge & Chip Separator
60" & 84" Roller Levellers
Peerless 6"x6" Saw
Rasmussen 6x6 with stock feed
18" & 27" 2 High Rolling Mills
Balancing Scales 10 lb. capacity
No. 42 Heald Formatic 2 spindle, single end
No. 1 Lees-Bradner Univ. Hobber
Detroit Power Screwdrivers

WEBER MACHINERY COMPANY

1801 E. 21st Cleveland 14, Ohio

Cherry 5292

EQUAL TO NEW

3½" Cincinnati-Gilbert Horizontal Boring Mill

3L Gisholt Universal Turret Lathe, 4½"

3R Gisholt Universal Turret Lathe, 6¼"

B4B NATCO 48-spdl. HOLESTEEL DRILL, #2 MT

All latest type

HAZARD BROWNELL

350 Waterman St., Providence 6, R.I.

Dexter 8880

IMMEDIATE DELIVERY FROM STOCK

BULLDOZER, No. 22 Wms & White, M.D.
GEAR GENERATOR, 12" Gleason Straight Bevel 1932 machine with gauges, gear, M.D.
GEAR HOBBERS, No. 12-H Gould & Eberhardt Universal, Motor Drive
LATHE, 30"x10' American 12-speed G.H.
PLANER, 48"x48"x10' Gray MAXIMUM SERVICE Dbl. Housing: 4 heads with PRT Direct Connected Reversing Motor Drive.

HOWARTH MACHINERY CO.

505 E. 9 Mile Road, Detroit 20, Mich.

Phone JOrdan 4-6490

B & S #3A universal milling machine, fully equipped, 1943
K & T #5H and #1H vertical milling machines, 1943
Liberty 48"x48"x18' four head planer, 1942
Pratt & Whitney 24"x24"x6' toolroom planer, rail and side head, like new
Defiance #25A horizontal boring mill, 3¾" bar, 1940, auxiliary table.
Sidney 18"x11' geared head lathe, swings 21½", taper attachment, 1941
Cincinnati #3 centerless grinders, filmatic
Reed #21 thread rolling machines, 1944
Automatic screw machines, 6 spindle; Greenlee 2"; Acme-Gridley 9/16".
Cincinnati centerless lapper, filmatic, 1942

JOHNSON MACHINERY COMPANY

59 Edison Place Newark 2, N. J.

"WALSH" PUNCH PRESSES

Size	Stroke	Delivery
6 Ton	1¼" or 1½"	10 days
12 Ton	1½" or 2"	Immediate
18 Ton	2" x or 2½"	Immediate
20 Ton	2½" or 3"	Immediate
24 Ton	2" or 2½"	Immediate
28 Ton	2½" or 3"	Immediate
38 Ton	3", 3½", or 4"	Immediate
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5" Bar Sellers Floor Type
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#3 and #4 Cincinnati Plain
#3-B and #4-B Kearney & Trecker Plain
#3-Kempsmith Plain
#5 Cincinnati Plain, Rectangular Overarm
#5 De Vlieg Bed Type Horizontal
#2 and #4 Cincinnati Vertical
#5 Reed-Prentice Vertical & Die Sinker
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30"x36"x18' Newton Combination Planer Type and Slab

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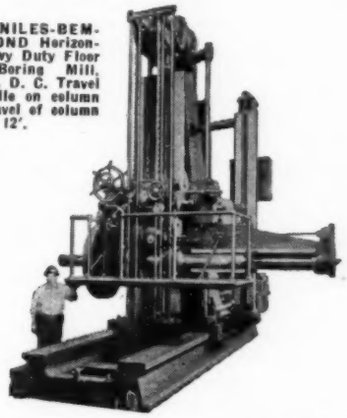

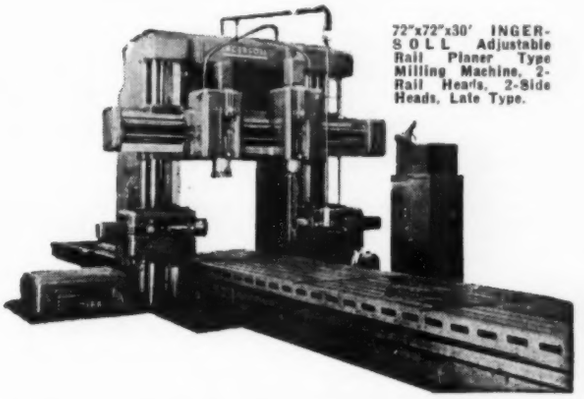

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Lathe, Turret 3-A W and S. S.P.D.
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Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 16"-20"-24"-36".
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Near new machine required, small, A-1 condition. Price must be low. Delivery N.Y.C. Give all details and price in reply.
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Each advertisement represents a current Want or Offering of an organization or individual in the field, with some element of profit in each for whoever can fill the need. Some have money-saving possibilities, others are opportunities for more business; many are employment opportunities; still others offer property, or equipment—used or surplus new equipment.

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20—#2G B. & S. High Speed Automatics, 1" & 1½"; 5—Model B ¾" Davenport 5-Spindle Automatics; 5—#61 New Britain-Gridley 6-Spindle Automatics, size 1⅝"x6"; 6—1⅝" Greenlee 6-Spindle Automatics; 2—1⅝" Conomatic 8-Spindle Automatics; 1—2⅜" Conomatic 6-Spindle Automatic; 3—3⅛" Conomatic 4 and 6-Spindle Automatics; 2—#665 New Britain-Gridley 6-Spindle Automatics; Approx. $100,000 in Accessory and Replacement Parts for All Automatic Machines.

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12—#3 W. & S. Universal 6-Speed All-Geared Head Turret Lathes; 9—#4 & #5 W. & S. Universal 12-Speed All-Geared Head Turret Lathes; 3—#2A & #3A W. & S. Universal H.D. Turret Lathes; 3—#2 B. & S. Wire-Feed Screw Machines.

PRODUCTION DEPARTMENT:

2—Model M-80 Taylor & Fenn Duplex Spline Mills; 7—#40 Lees-Bradner, Ring Type Thread Millers; 4—#M-18 & M-24 Milwaukee Simplex Millers; 6—#1M Kent Owens Hydraulic Millers; 4—#31 and 31-L Excello Thread Grinders; #500-C Manville Thread Roller; 5—#81 Heald Gagematic & Sizematic Internal Grinders, centerless and internal types; 2—#72A3 Heald Internals; 4—#16, #112 and #5 Bryant Internal Hole Grinders; 3—#11 & #16 Blanchard Vertical Rotary Surface Grinders; 7—#2 Cincinnati Centerless Grinders; 1" Double and 1½" Single Landis Threaders; 8—#D-B-2112A & 1212A Single and Double Spindle Excello Boromatics; 5—Micro-Matic & Sunnen Honing Machines; A-312 Arter Rotary Surface Grinder; 10—6"x18", 6"x30", 10"x18" and 10"x36" Norton Type C Hydraulic Plain Cyl. Grinders; 4—#5 and 1—#20 B. & S. Plain Cyl. Grinders; 3—#2 B. & S. Universal Cyl. Grinders; 5—#13 B. & S., 1—#2 LeBlond, and #630 Van Norman Universal Tool & Cutter Grinders; #6 Landis Precision Thread Grinder; 5—#2B B. & S. and #2 Ohio Surface Grinders.

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An inhibited phosphoric acid which when reduced with water produces a solution for removing rust and scale from iron and steel surfaces by immersion.

PARCO CLEANER 220
A more active phosphoric acid cleaner to be diluted with water for removing rust and scale from iron and steel surfaces. To be used when slight attack on metal is desired.

PARCO CLEANER 250
A wash-off type phosphoric acid cleaner containing phosphoric acid and an organic grease solvent. To remove grease, oil, rust, and light annealing oxide from iron and steel surfaces.

PARCO CLEANER 260
A dry-off type phosphoric acid cleaner which contains phosphoric acid and an organic grease solvent. A touch-up material to remove grease and spot rusting from iron and steel.

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PARCO CLEANER 100
A homogenized water dispersion of an emulsifiable petroleum solvent cleaner. For pressure spray cleaning prior to Bonderizing.

PARCO CLEANER 101
A concentrated emulsifiable petroleum solvent cleaner designed for pressure spray cleaning of metal surfaces prior to Bonderizing. Contains no water, will not freeze.

PARCO CLEANER 110
A nonemulsifiable solvent cleaner designed for use with mineral spirits or kerosene in the immersion cleaning of machined metal parts prior to Parco Lubrizing.

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PARCO CLEANER 301
A water conditioning material formulated especially for stabilizing emulsion type cleaners. Conditions metal surfaces to receive fine, dense Bonderite coating. Reduces amount of cleaner required.

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Cleans Spra-Bonderizing pipes, nozzles, coils, and pump intake and discharge lines without dismantling. Saves time, reduces labor, and prolongs equipment life.

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Detroit 11, Michigan

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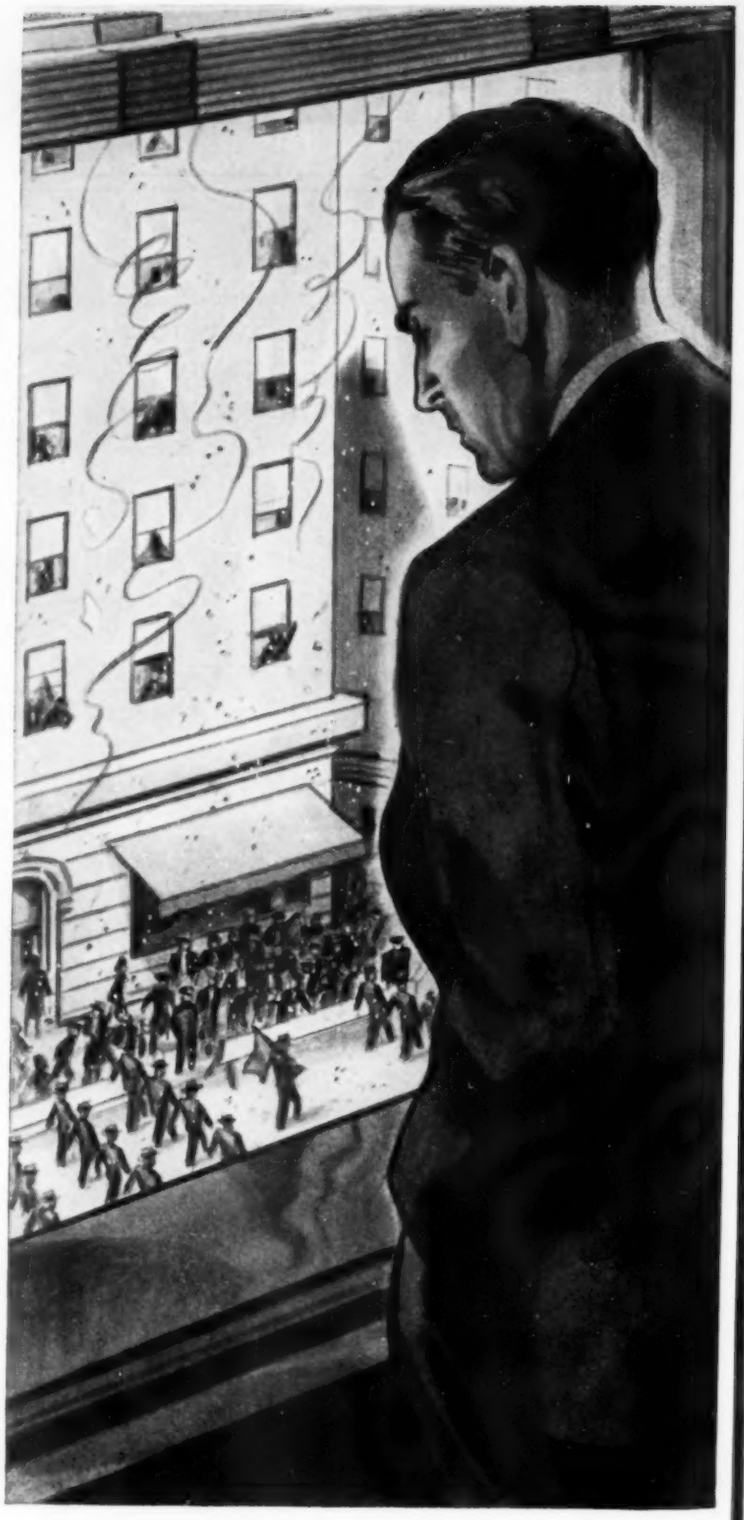
MEMO TO PRESIDENTS WHO WATCHED THE BAND GO BY!



HERE'S ONE parade that isn't "all over but the shouting" after the band has passed. It's the Payroll Savings Plan for the regular purchase of U. S. Security Bonds by employees.

Though the formal spring campaign to sell Bonds is over, any company can still move forward with the parade. Right now thousands of companies are putting *additional push* behind their Payroll Savings Plans. Managements of many companies that have not yet participated are *now installing* the Plan.

It's a "look-ahead" plan, that benefits employee, company, and nation. Every $3 invested in Bonds pay $4 at maturity. Personnel records in the plants with active P. S. P. programs show improved employee attitudes—evidenced by less absenteeism and fewer accidents—as the individual's sense of security grows with Bond purchases. And every Security Bond dollar built up in the Treasury retires a dollar of the national debt that is potentially inflationary. It means less bidding-up of prices. Moreover, Bond buyers are better citizens because they have a tangible stake in the nation's future.

It's just as easy to take action now as when the campaign was at its height. Just call your Treasury Department's State Director, Savings Bonds Division, and ask for the material that helps to get a Payroll Plan started or to keep it rolling.

The Treasury Department acknowledges with appreciation the publication of this message by

American Machinist

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council.

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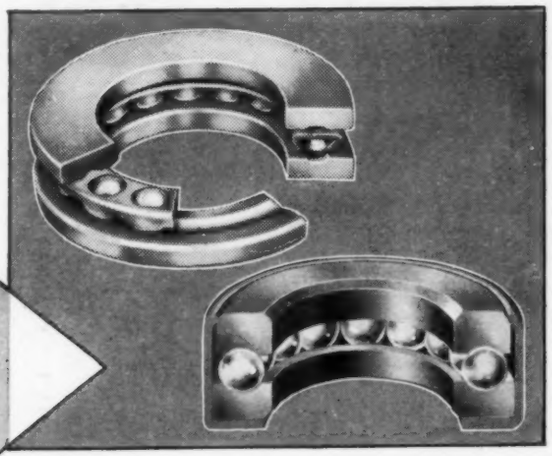
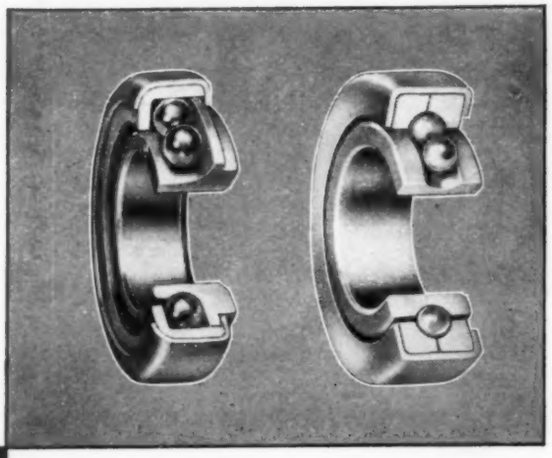
Friction Problem?

TRY NICE

FOR QUALITY PLUS ECONOMY





Performance or price — whatever your problem, we confidently invite your investigation of NICE BALL BEARINGS.

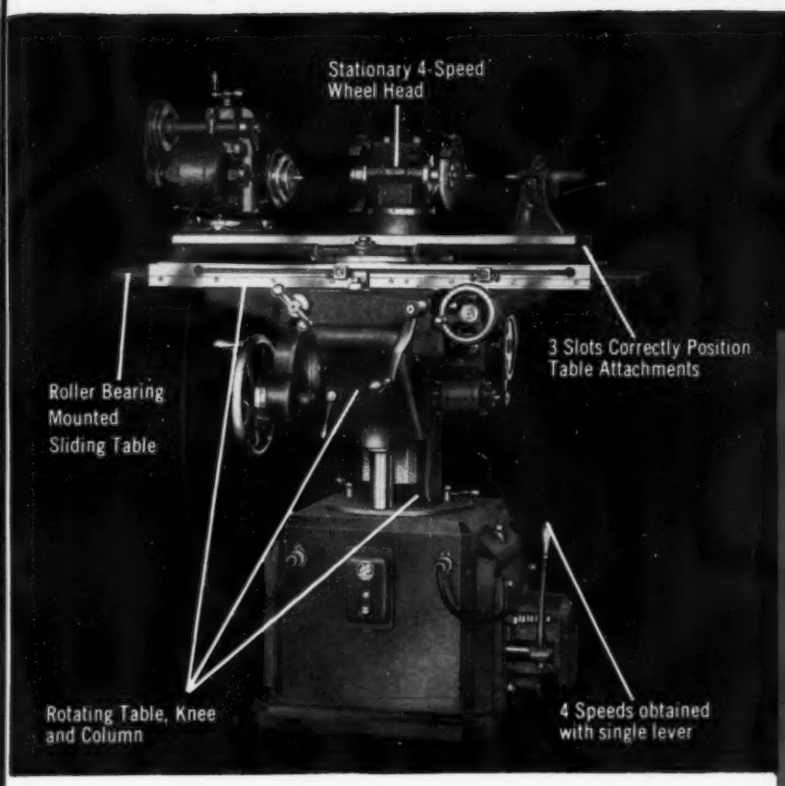
Write for Catalog No. 125

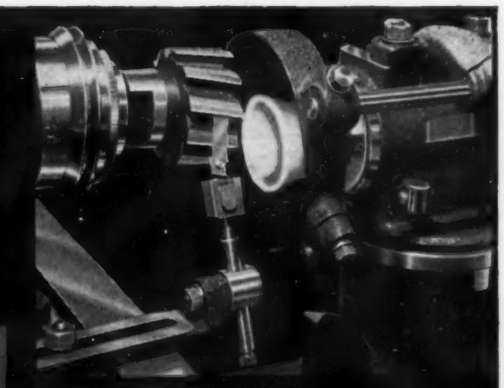
NICE offers, for your consideration, several complete lines of "catalog standards", a few types of which are illustrated. In addition, Nice is tooled to produce many hundreds of "specials", and experienced Nice engineers are prepared to recommend or design the "exactly right" bearing for your application.

NICE now producing "Series 1600", a new line of low cost precision radial bearings, and "Series 3000", a new line of unground "precision type" radials, as illustrated. These bearings are inch dimensioned and can be furnished with or without shields.

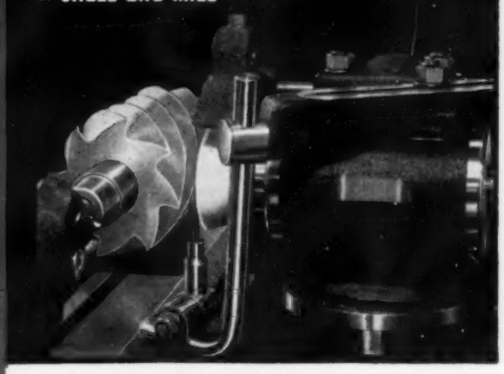
NICE

NICE BALL BEARING COMPANY
NICETOWN · PHILADELPHIA · PENNSYLVANIA

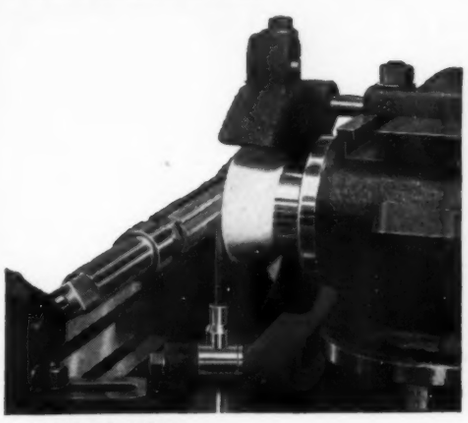

Stationary 4-Speed Wheel Head
3 Slots Correctly Position Table Attachments
Roller Bearing Mounted Sliding Table
Rotating Table, Knee and Column
4 Speeds obtained with single lever



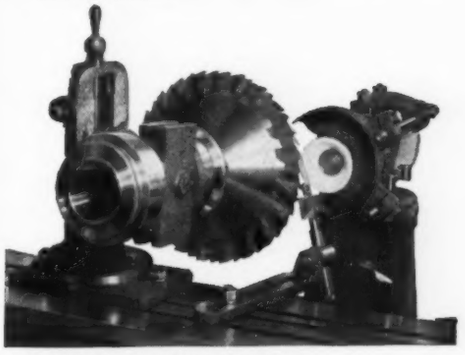
★ SHELL END MILL



★ SPIRAL MILLING CUTTERS



★ HAND REAMERS



★ STAGGERED TOOTH CUTTER

Get more grinding speeds quicker with the LeBlond No. 2 Universal Cutter Grinder

The "secret" of the LeBlond No. 2 is the stationary wheel head—the only grinder that can give you all the speeds you need easily and quickly. Only on the LeBlond No. 2 can you select four speeds—6500, 5100, 4000, and 3100 rpm—with a single lever.

In addition, the LeBlond No. 2 is one of the most universal of its type. With the generous equipment furnished as standard, you can grind an almost unlimited variety of reamers, mills, taps, and cutters.

Be sure you're getting the speed, capacity, and flexibility you need for modern tool room grinding—get the LeBlond No. 2. For complete information, ask the LeBlond distributor nearest you for descriptive bulletin today.

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
New York 6, N. Y., Singer Bldg., 149 Broadway, COurtland 7-6621
Chicago 6, Ill., 20 N. Wacker Drive, STAte 5561
Philadelphia 40, Pa., Beury Bldg., 3701 N. Broad, SAgamore 2-5900
Detroit 2, Michigan, New Center Building, TRinity 3-5561

send for

your copy of the No. 2 Cutter Grinder bulletin. The valuable Manual of Tool Room Grinding is also available free of charge.

LeBLOND

New high speed hand miller gets helping hand from Timken® bearings

FOR greater accuracy at spindle speeds of 3,600 r.p.m., The United States Machine Tool Company mounts the spindle of its new hand feed milling machine on Timken tapered roller bearings.

Timken bearings hold spindles rigid, yet free to rotate easily. Due to the line contact between the rolls and races, the spindle is firmly supported—no chance of deflection.

Because of tapered construction and provision for take-up in assembly, there is no possibility of end-movement. Made of Timken fine alloy steel, Timken bearings are selected to last the life of the machine.

No other bearing can bring you *all* the advantages you get with Timken tapered roller bearings—backed by 49 years of bearing research and development. Be sure you have them in the machine tools you buy or build. Always look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED — *This symbol on a product means its bearings are the best.*

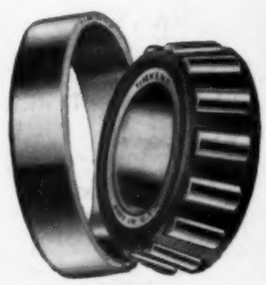
THE UNITED STATES MACHINE TOOL COMPANY *provides greater accuracy, longer life in its new hand miller by mounting the spindle on two Timken tapered roller bearings.*

TIMKEN BEARING
CAPACITY RATINGS INCREASED 25%.

Since Timken bearings were re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ←◫→ LOADS OR ANY COMBINATION ←◫